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USSR Report

CONSTRUCTION AND EQUIPMENT

No. 33

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CONTENTS

CONSTRUCTION

On Concentration of Capital Investments
(P. Ananskikh; PLANOVOYE KHOZYAYSTVO, No 12, 1980) 1

Role of Credit in Future Kazakh Capital Construction Explained
(S. Kalenova; NARODNOYE KHOZYAYSTVO KAZAKHSTANA, Oct 80).... 12

Economist Says Uzbek Capital Construction Must Aim at Final Result
(Z. Salokhiddinov; EKONOMIKA I ZHIZN', Nov 80) 15

Development of Construction Complex Outlined
(B. Kostrikov; PLANOVOYE KHOZYAYSTVO, No 1, 1981) 20

Progress Noted in Construction of Nuclear Power Plant
(I. I. Semykin, B. K. Lebedev; STROITEL'STVO I ARKHITEKTURA LENINGRADA, No 2, 1981) 28

Building Apartment Houses With BKR-2 Box Modules
(L. M. Terekhovkina; ZHILISHCHNOYE STROITEL'STVO, No 12, 1980) 34

Experimental Housing Construction in Moscow
(V. G. Trofimov; ZHILISHCHNOYE STROITEL'STVO, No 12, 1980).. 36

New Book Covers Problems of Fully Prefabricated Housing Construction
(Ye. P. Pankratov; ZHILISHCHNOYE STROITEL'STVO, No 1, 1981). 38

Two-Year Flow-Line Construction Schedule
(L. S. Murlykov, V. P. Kaverin; ZHILISHCHNOYE STROITEL'STVO, No 2, 1981) 43

Management of Construction in a Large Region
(L. P. Markizov, N. M. Bol'shakov; ZHILISHCHNOYE STROITEL'STVO, No 2, 1981) 47

Potential for Cast-in-Place Concrete Housing Construction in Rural Areas
(A. M. Lysova; ZHILISHCHNOYE STROITEL'STVO, No 2, 1981) ... 52

CONSTRUCTION MACHINERY

Armenian Builders Not Making Optimum Use of Construction Machinery
(N. A. Akopyan, V. G. Kelkchyan; PROMYSHLENNOST' ARMENII, Oct 80) 56

Armenia's Machinery Manufacturing Continues To Grow Rapidly
(A. S. Alpetyan; PROMYSHLENNOST' ARMENII, Nov 80) 58

METALWORKING EQUIPMENT

Introduction of Measures for Ensuring Proper Use of Materials
(M. A. Pryalin; STANDARTY I KACHESTVO, Jan 81) 62

Industrial Robots at Minsk 'Termoplast' Plant
(V. Bibikov; PROMYSHLENNOST' BELORUSSII, Dec 80) 67

CONSTRUCTION

ON CONCENTRATION OF CAPITAL INVESTMENTS

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 12, 1980 pp 78-83

[Article by P. Ananskikh, Simferopol']

[Text] The concentration of capital investments is becoming an exceedingly important problem in increasing their efficiency and in speeding up activation of production capacities. The need for concentration was pointed out in decisions of the 25th CPSU Congress. Many principles embodied in the decree of the CPSU Central Committee and USSR Council of Ministers entitled "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" were aimed at achieving this goal.

Concentration of capital investments helps to shorten construction time, make the pace of construction more uniform, improve the quality of construction, carry out projects rapidly and apply the innovations of science and technology to production. But in spite of the obvious importance of this problem, explorations for a solution to it have still not yielded the desired results. Nor has it been adequately reflected in the practice of planning and managing capital construction and in the relations between customers and construction contractors. Little attention is being paid to it on the part of economic science. It has not been properly reflected in the programs and teaching aids concerning construction economics. This could not but have had an effect on the approach personnel employed in construction take to solving it. It is by no means an accident, then, that in the field at the present time even personnel of staff services for planning and statistics do not have the necessary knowledge of the concentration of capital investments and ways and methods of accomplishing it.

It is also difficult to name any unit in the management of construction which would summarize and analyze the state of affairs in this area of economic activity and would keep an eye on the concentration of capital investments and prevent their being scattered. Construction organizations submit to institutions of the Central Statistical Administration many diverse statistical report forms from which one can determine concentration, but it is not actually calculated. As a result the true situation is not detected on time, and ultimately rather adverse situations are recorded year after year. Moreover, local agencies, which do not receive information on the concentration of resources at construction sites, do not have an influence on this process, and it often comes about arbitrarily. This has been indicated by numerous specific cases.

Last year the Krymskaya Oblast People's Control Committee decided to run a check on fulfillment of party decisions concerning concentration. But doing this proved not to be a simple matter, since, as it turned out, neither the clients nor the contractors kept records of the concentration of investments and did not even have the necessary initial data for computing it. Nor were branches of USSR Gosbank and USSR Stroybank keeping records on concentration. Bank branches in Krymskaya Oblast gather data for calculation of concentration over a period of 3 or 4 weeks. But the process was problematical because procedural and methods guidelines have not been drafted on calculations of the concentration of capital investments, nor has the experience which has been studied been treated in periodicals. They had to begin, as the saying goes, "from scratch."

Our form for calculation of the level of concentration at projects destined for production purposes includes information on the full estimated cost of construction and the remainder of that value, limits allocated for the planning year, the date of commencement of construction, and the standard and anticipated construction time. Moreover, this anticipated construction time was expressed in two ways. On the one hand the time was determined from the beginning of the planning year and the beginning of construction; on the other we took the ratio of the remainder of the estimated cost to the annual limits of capital investments. By computing the time necessary to assimilate the remainders of the estimated cost and taking into account the annual limits of capital investments, we determined the anticipated construction time. The standard construction time for most projects was taken from the Central Statistical Administration reporting form 8-KS (concerning plans for each construction project of a production facility).

The average anticipated construction time and average standard construction time were calculated for the entire set of projects with these formulas

$T_{o.s} = \Sigma KT_i^o/K; \; T_{n.s} = \Sigma KT_i^n/K,$

where $T_{o.s}$ and $T_{n.s}$ are the average anticipated and average standard construction times, respectively, in months;
K is the estimated cost of the project;
T_i^o and T_i^n are the anticipated and standard construction times, respectively, of projects.

The level of concentration for individual projects (U_k) in the planning year was determined by dividing the planned annual total amount of capital investments (K_p) by the sum total of capital investments (K_n) which should be allocated in accordance with the allowed construction time:

$U_k = (K_p/K_n)100.$

The concentration for planning purposes was calculated from the figures given in the table. A table like this might serve as an appendix to title lists of construction sites or capital construction plans. It is evident from the figures in the table that in the preliminary plan the most important project was Project No 1, which had an estimated cost of 46 million rubles and 32 million rubles of the estimated cost remaining. In accordance with the standard construction time, 12 million rubles of capital investments should have been allocated for 1980, but in the original plan 10 million rubles were scheduled. The project went under construction on 1 January 1978, and had been under construction for 2 years before the beginning of the planning year. On the basis of the limits outlined, it would be under construction another 3.2 years. Thus the anticipated construction time was 5.2 years, and the standard construction time 4 years.

	Project Number, According to the Plan					
	1	2	3	4	5	Total
		Preliminary Plan				
Estimated construction cost, millions of rubles						
Total	46	12	8	1	1	68
Remainder	32	9	8	1	1	51
Date of commencement of construction	1 Jan 78	1 Jul 79	1 Jan 80	1 Jan 80	1 Jan 80	--
Capital investments, millions of rubles						
As planned	10.0	6.0	3.0	0.5	0.5	20.0
Standard	12.0	6.0	5.1	1.0	1.0	25.1
Construction time, years						
Up to commencement of the planning year	2.00	0.50	--	--	--	--
To completion of construction	3.20	1.50	2.70	2.00	2.00	--
Construction time, years						
Anticipated	5.20	2.00	2.70	2.00	2.00	4.25
Standard	4.00	2.00	1.60	1.00	1.00	3.30
Level of return, %						
For the planning year	83	100	59	50	50	80
Since commencement of construction	77	100	--	--	--	77
		Final Plan				
Estimated construction cost, millions of rubles						
Total	46	12	1			59
Remainder	32	9	1			42
Date of commencement of construction	1 Jan 78	1 Jul 79	1 Jan 80			--
Capital investments, millions of rubles						
As planned	13.0	6.0	1.0			20.0
Standard	12.0	6.0	1.0			19.0
Construction time years						
Up to commencement of the planning year	2.00	0.50	--			--
To completion of construction	2.46	1.50	1.00			--

Table (continued)

	Project Number, According to the Plan					
	1	2	3	4	5	Total
Construction time, years						
Anticipated	4.46	2.00	1.00			3.88
Standard	4.00	2.00	1.00			3.54
Level of return, %						
For the planning year	108	100	100			105
Since commencement of construction	90	100	100			91

The level of concentration, taking into account the previous period of construction, was 77 percent (4.0:5.2 · 100). The level of concentration for the planning year is determined by dividing the annual limit under the plan by the limit based on the standard. For Project No 1 it was 83 percent (10:12 · 100). The average level of concentration, taking into account the lag in construction over the previous period, was 77 percent (223:289 · 100) for the preliminary plan and 80 percent for the planning year; these were determined by dividing the total limit under the plan by the total limit called for by the standard (20.0:25.1 · 100).

As we see, for the planning year and for the entire period since commencement of construction of the projects the level of concentration in the preliminary plan was 20-23 percent below the standard. This plan is unacceptable, since it does not meet the requirements of binding decisions of the party and government concerning capital construction.

In his address at the November (1979) Plenum of the CPSU Central Committee L. I. Brezhnev said that after the decision is made to build projects for production purposes "capital investments and physical and financial resources should be allocated to new construction projects in full conformity with standards."[1] It has been pointed out to local authorities that they must "put an end to the spreading thin of capital investments once and for all."[2]

The decree of the CPSU Central Committee and USSR Council of Ministers dated 12 July 1979 notes that the volume of construction and installation work in drafts of title lists are distributed by years in accordance with the construction time called for by standards. That is why the preliminary plan needs to be reworked in order to take into account the normative requirements contained in the directives. In our example (see the table) it would be advisable to omit from the plan and postpone for the next year commencement of construction on the new projects Nos 3, 4 and 5, but it would be possible to restrict oneself to eliminating only the projects listed as Nos 3 and 5. In this case the level of concentration of capital investments for the planning year would be 108 percent for Project No 1, which is the most important, and the average for all projects would be 105 percent. But when the previous period of construction is taken into account, the average level of concentration (91 percent) will be 9 percent lower than the standard. But we can concur in this provided that in the next year, 1981, the limits for Project No 1 are met and the level of concentration reaches the standard by the end of construction.

Fulfillment of this condition is stipulated by the principle contained in Decree No 695, which states: "If in the past year work at a construction site has been done in a smaller volume than envisaged in the title list, the lag must be made up in the subsequent year by virtue of material and technical resources not used in the previous year and also by virtue of the reserves of ministries and departments."[3] Concentration of capital investments for the planning year at a level of 105 percent (as follows from the calculations given) also meets the requirements of the decree we have mentioned, which allows the setting aside of a reserve of capital investments, construction and installation work and contract work amounting to 5 percent of their total limit, along with the corresponding materials and financial resources. It is clear that this reserve would ultimately be used for especially important new construction projects.

We will determine the losses from the scattering of capital investments called for in the preliminary plan and the gain derived from improving concentration in the final plan. According to the preliminary plan the average construction time exceeds the average standard time by 0.95 year. If we multiply the sum total of capital investment by the efficiency coefficient 0.12 and by the difference in construction time, the size of the anticipated losses of profit will be 7.75 million rubles (0.12 · 68 · 0.95). In order to ascertain the losses of builders on the basis of overhead, we compute the averaged coefficients for projects of production facilities and housing and public works construction (ZhGS). For the former it would be 0.04 percent of capital investments under the conditions of the Crimea, and for ZhGS projects it would be 0.06. Losses to builders based on overhead could reach approximately 600,000 rubles in the preliminary plan:

[0.04 · 68(1 - [3.3/4.25])].

A relative gain will be obtained under the final capital construction plan thanks to improved concentration of capital investments. In absolute terms the losses would then be considerably smaller in proportion. The losses of profit would be 2.41 million rubles (0.12 · 59 · 0.34), and the losses on overhead would be 210,000 rubles:

[0.04 · 0.59(1 - [3.54/3.88])].

By comparison with the preliminary plan, thanks to the increased concentration a substantial gain has been achieved both for the national economy and also for the construction contracting organizations. It is manifested in a sizable reduction of the losses, which would be 5.34 million rubles in profit and 390,000 rubles for contract organizations. In our view there should be an incentive for planning agencies and agencies managing construction to achieve that gain and to reduce losses from the scattering of capital investments.

Since the level of concentration is not calculated, the losses from the scattering of resources are unfortunately not determined. As a result personnel that take part in planning and managing capital construction have no incentive to increase the concentration of capital investments, and that is why we observe undesirable and often uncontrollable processes and tendencies in this area.

An analysis of the situation at construction projects in Krymskaya Oblast shows that on the average projects carried over from one year to the next had been under construction for 1.3 years. The anticipated average construction time according to the resources allocated in the plan was 3.6 years, the total anticipated time was 4.9 years, and the average standard or allowed time was 3 years. It was thus expected that construction time would exceed the standard by almost 2 years. Total anticipated losses from protracted construction is computed at 200 million rubles of profit. But at construction projects near completion, however surprising it may seem, the situation was still worse. At 39 projects near completion, where the remainder of the estimated limit was 102.5 million rubles, only 50.8 million rubles, that is, 50 percent, were allocated to complete construction. In other words, construction projects near completion are condemned from the very outset to a "starvation ration" or to delivery with major items incomplete. At the same time when resources were lacking at construction projects near completion, the plan included 614 new projects for whose construction 84.6 million rubles were allocated.

An analysis of the figures for the most important new construction projects over the last 3 years revealed that the actual results of concentration are considerably lower than planned. The planned level of concentration was 61 percent (3.0:4.9 • 100). For construction projects put into operation, which had an estimated cost of 275 million rubles, the actual average construction time was 4.4 years, though the standard allowed time was 2.2 years. The actual level of concentration reached only 50 percent, and the minimum losses of profit were 74 million rubles. The builders lost about 6 million rubles because of higher overhead. These results were set forth in a session of the Krymskaya Oblast Soviet of People's Deputies.[4]

One might assume that in housing and public works construction the level of concentration of resources would be higher, since here it is easier to adhere to the standard time than in building complicated industrial projects. But these suppositions do not correspond to reality. The level of concentration for housing and public works construction projects over the last 3 years has averaged only 38 percent. The situation is especially alarming in housing construction, where a tendency toward increased scattering of resources has been discovered. Over the last 3 years, while the average allowed time for construction of residential buildings was 8.3 months, the actual construction time increased from 15.1 to 18.1 months, and the level of concentration dropped from 55 to 46 percent. Concentration of resources at public works construction projects rose over that period from 28 to 37 percent. At such rates about 7 years are required to attain normal concentration.

The uncontrollability of the processes of concentration is confirmed at the local level by the following case. The builders in Kerch', where the bulk of the construction work is done by the trust Kerch'metallurgstroy, attained in 1975 the highest concentration of resources in the oblast for all housing and public works construction projects--90 percent, including a concentration of 118 percent at public works construction projects. But the next year its level dropped to 77 percent, and then again to 60 percent, and for public works construction projects it dropped to 40 percent. The level of concentration dropped to one-third in just 2 years. As a result builders lost 15 million rubles simply because overhead was exceeded, and they also failed to receive 8.2 million rubles of rent.

The problems of management of capital construction are also related to the concentration of resources. Recently builders have been reproaching clients for the lack of balance in construction plans and the overload in them. At first glance this seems valid if we assume that the builders are not involved in solving the imbalances that have arisen. But not uncommonly the directors of construction organizations, who understand quite well the reasons for the discrepancies, do not themselves take steps to ensure that plans are balanced and resources are concentrated; they take the position of onlookers, and then when the discrepancies and shortfalls become obvious, they spread their hands as though they are helpless. It is clear to many of them that the number of projects planned must be reduced in order to balance the plan and achieve concentration of resources. "But who is to say which project is not needed? After all, every one of them has its owner and its sponsor and protector, and he will be quick to notify the monitoring agencies. And they will in turn set in motion the mechanism for administrative and other action. And everything goes round and round in a circle. This acute shortage of labor resources and chronic shortage of material and technical resources, which are reliably based on the unrealistic program of contract work, grow into an unrestrained squandering of energies and resources...."[5] Usually construction organizations, which the clients have over a barrel, become accomplices and ultimately principal offenders in violation of the procedure in capital construction established by the binding decisions and legislative acts.

Builders should not be blind executors of instructions and demands which not uncommonly are arbitrary. First of all, it is erroneous both in form and in principle to put the question of which project is not necessary. Neither the customer nor the superior economic agency will give an answer to the question. With the rare exception all projects are needed. But since they cannot all be built at one time, it is valid to put the question of the degree of importance and the advisable order in which they should be built, i.e., to raise the issue of ranking the projects.

Second, the builders themselves have drafted standards and rules (SNiPy) whose fulfillment is required both of them and their partners. Bolder use should be made of this document instead of merely posing the question of which projects is not necessary. After all, there is nothing to prevent officials of a particular construction organization from entering into agreement with the planners and customers concerning the order in which projects are to be built as a function of their relative importance. Moreover, as soon as the volume of work reaches the proportions of the resources of the general contractor, and the list of projects has been backed up with capital investments at the level of the assigned standard concentration, further inclusion of projects in the plan should be terminated, since it results in a scattering of resources with all the baneful consequences. Carrying over a portion of the projects to the subsequent period is the principal and indeed only way to achieve concentration.

But let us suppose that the superior management entities are beginning to deliberately overburden the plan and scatter resources. In this case the economists of construction organizations must evaluate the plan from the standpoint of the concentration of resources, determine the loss which the scattering will bring about, and raise the issue of guaranteed reimbursement of builders for anticipated losses because of overhead and payment of higher interest on credit and reimbursement of the lost bonus which they would have obtained by meeting deadlines for putting projects into service. At that point most clients resorting to unnecessary pressure will undoubtedly relent. In the final analysis it is the construction organizations which have all the grounds for appealing to monitoring and law enforcement agencies for help when their partners do not give in. Yet, reluctant to argue with their partners, they do not do this. And this is another case of the indirect effect of the scattering of resources.

We should bear in mind that customers are not always informed about the resources of builders and of the state. So they order as many projects as possible on the basis of the worldly principle: the more you ask for, the more you get. What is more, the client does not always have the possibility of evaluating the level of concentration or scattering of resources. It is the contractor, with the summary data he has in the plan which has been outlined of the construction association and ministry, who can easily determine the discrepancy between the list of orders and the resources of the builders, who can evaluate the outlines of the plan, who can draw the appropriate conclusions and who can make decisions and take specific steps toward concentration. This is in fact his outright duty, one that follows from party decisions and legislation.

The decree of the CPSU Central Committee and USSR Council of Ministers on improvement of the economic mechanism calls for a gradual transition to the comprehensive contract, i.e., to financing construction of projects with credit furnished by USSR Stroybank to construction and installation contractors in the amount of the full cost accepted by the general contractor, whereby the finished enterprises (installations) are to be turned over to clients as "turnkey" projects. One of the principal methods of eliminating the scattering of resources and of sharply reducing capital construction time is to conclude comprehensive contracts and to disseminate this practice more widely. It can be said with confidence that most of the problems, nonfulfillment and disorder in capital construction occur because there is no overall contract and no single coordinator of the construction process.

The errors of the past must be avoided. It is well known that over the last 10 years builders have done little toward effective conduct of the experiment with the comprehensive contract. In the past certain construction ministries explained their refusal to participate in the experiment by saying that they had no staff of specialists for equipment, that they were not in a position to accept and store equipment, and so on.[6]

Now all the conditions obtain for removing the obstacles that stand in the way of the experiment. Yet the situation has not changed at all: one of the reasons for this is the position taken by officials of USSR Gosstroy, who are still not giving proper support to the comprehensive contract, alleging that the recommendations concerning it do not take into account the system that has taken shape for management of the national economy. Yet this experiment was indeed intended to improve the system of management of capital construction. And though this is sector is closely bound up with the entire national economy, like any other sector, it has its own specific production characteristics and its independent system of management. Which is why it is the officials of USSR Gosstroy who should be advancing specific proposals to improve that system.

The attachment of officials of USSR Gosstroy to the system of management of capital construction that now exists has its reasons. This system creates conditions for depersonalization of responsibility for implementing principles issued as directives and actual legislation and standards. For instance, the steps foreseen to combat the scattering of resources in the decree of the CPSU Central Committee and USSR Council of Ministers on improving the planning of capital construction, dated 28 May 1969, included among normative acts construction standards and rules of USSR Gosstroy. What have the officials of USSR Gosstroy undertaken to carry out this decree, which has become the basis of legislation on capital construction? If one is to judge by the scattering of resources, which has not ceased over the last 10 years, practically nothing. There have even been notable attempts to prove noninvolvement. Instead of furnishing a thoroughgoing solution to the problem, they reproach the project planners, the planners, the clients and the financial specialists.

Yet considerable experience with construction under comprehensive contracts has been gained in world practice. K. Marx wrote in his time: "... in the era of advanced capitalism, when on the one hand sizable masses of capital are concentrated in the hands of individuals and when on the other the associated capitalist (joint stock companies) has emerged alongside individual capitalists, and at the same time the field of credit has already developed, the capitalist entrepreneur in construction builds structures on order for individual private persons only as an exception. What he undertakes is to build for the market an entire series of dwellings and entire city blocks...."[7]

Construction of residential projects in which customers were not involved was organized by assembly-line technology back in the last century. The customers purchased finished dwellings. Construction of industrial enterprises is by and large organized similarly even at the present time. In the United States the comprehensive contract under which preparation of the project plan and the planning of construction in all stages are concentrated in the hands of the head construction firm, covers about 70 percent of orders. The head firm coordinates the work of the subcontractors, monitors adherence to the project plan, and organizes the delivery of materials and equipment and installation of the latter. This system affords the possibility of combining project planning and construction. Since construction begins when the engineering part of the design is 20-30-percent completed, the construction time of major projects is reduced by 1 year and their cost is reduced by 10-20 percent. Average construction time of turnkey industrial projects from commencement of project planning is about 3 years. By and large attainment of rated capacity is achieved in the stage of construction.

Our own construction not uncommonly drags on for years. During that time the innovations representing technical progress which have been foreseen in feasibility studies, in assignments for project planning and in the project plan become outdated, and the national economy does not realize the intended benefit. One of the reasons for this situation is that certain units in capital construction are cumbersome and disassociated. A customer with a future assignment for project planning visits a large number of higher-level agencies; planning agencies and project planners may or may not accept for project preparation the assignment for project planning that has been drawn up with care, and the developers may or may not meet the deadlines. Afterward the customer again goes from one agency to another, waits for the funding to be allocated and for the resources to be included in the construction plan, and so on.

The only way out is to make the chain stronger by eliminating its superfluous links and strengthening the links which remain, as pointed out at the 25th CPSU Congress. "In the area of incentives: encouragement of time saving and strict penalties for wasting time. In the area of organization: elimination of superfluous units and bureaucratic procedures, responsive decisionmaking."[8] That is precisely the goal pursued by conducting the experiment involving the comprehensive contract.

We first of all need to understand the customer's position. At present he performs the role of a transmission link between the general contractor on the one hand and the project planners and suppliers on the other.

With the introduction of the comprehensive contract the principal unit in capital construction, its coordinator, who is endowed with large powers and responsibilities, emerges. Responsibility ceases to be multipersonal or impersonal and begins to take on more distinct outlines and is assigned specifically. The socialist planning system makes it possible to reduce the number of links in capital construction to two or three instead of six or eight, as is now the case. Ideally two links are possible for new construction and reconstruction (expansion) of enterprises: the general contractor and suppliers and the general customer and supplier.

We can offer as an example construction of the North Crimean Canal and the Krymskaya AES. Here the client and the general contractor were in the same management system of their ministry. They began all operations to build the project "from scratch." To be specific, before work began neither the customer as represented by the management of the enterprise being built, nor the general contractor have the relevant specialists, experience, construction capability or facilities for storing equipment. Given this situation, nothing stood in the way of temporary or permanent unification, until operation of the projects should begin, of the energies and functions of project planners, the customer and subcontractors in one component of the general contractor. Supply agencies took all orders for materials and equipment and made all deliveries of the same. In the reconstruction (expansion) of existing enterprises the general client and suppliers figure as the coordinators.

As demonstrated by historical and present-day experience, the comprehensive contract or comprehensive firm headed by the general contractor or general client affords the possibility of reducing capital construction time to between one-half and one-third and of increasing the efficiency of capital investments correspondingly. This has been a practical step that has made it possible to carry out the instructions issued as directives by the 25th CPSU Congress on taking the time factor into account.

The decree of the CPSU Central Committee and USSR Council of Ministers on improvement of the economic mechanism establishes improved indicators for evaluating the performance of builders, a settlement procedure for projects, financial penalties and the drafting of stable capital construction plans. It is playing a constructive role in the concentration of capital investments and in reducing project construction time. But organizational measures to improve recordkeeping, monitoring and incentives are needed to carry out the decisions that have been made.

FOOTNOTES

1. Brezhnev, L. I., "Rech' na Plenume Tsentral'nogo Komiteta KPSS 27 noyabrya 1979 goda" [Speech Delivered at the Plenum of the CPSU Central Committee on 27 November 1979], Moscow, Politizdat, 1979, p 16.

2. Ibid., p 15.

3. "Sovershenstvovaniye khozyaystvennogo mekhanizma. Sbornik dokumentov" [Improvement of the Economic Mechanism. Collection of Documents], Moscow, Pravda, 1980, p 22.

4. KRYMSKAYA PRAVDA, 21 June 1979.

5. PRAVDA, 25 March 1979.

6. STROITEL'NAYA GAZETA, 29 June 1973, in drawing up the ungratifying results of commencement of the experiment, noted that the arguments of the builders might be convincing under one condition: if one looks at things in the old way, in the traditional way. But in the present situation this view is unacceptable, because the new method and present structure for management of construction are mutually exclusive. It is beyond dispute that the builders cannot perform the functions concerned with deliveries of equipment without making any changes of their own. The failure with the experiment is a consequence of the formalistic approach to carrying it out.

7. Marx, K., and Engels, F., "Sochineniya" [Works], Vol 24, p 263.

8. "Materialy XXV s"yezda KPSS" [Proceedings of the 25th CPSU Congress], Moscow, Politizdat, 1978, p 61.

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CONSTRUCTION

ROLE OF CREDIT IN FUTURE KAZAKH CAPITAL CONSTRUCTION EXPLAINED

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 10, Oct 80 pp 48-49

[Article by S. Kalenova, senior economist of the Lenin Division of USSR Stroybank, Alma-Ata: "Capital Investment and Credit"]

[Text] Statistics testify: the role of credit as a means of financing has grown considerably in recent years. Since 1965 short-term credit has increased almost 3-fold, long-term credit almost 8-fold. Such an increase in the scale of credit-granting is explained primarily by an expansion of the sphere of economic methods for controlling the national economy.

It should be noted that the credit method of furnishing funds has a number of advantages over budget financing and taking funds from in-house sources. Clients' settlements with the prime contractors are made steadily in this case, and the cost of equipment that does not require installation and is not included in the budget estimates for the construction project is paid for without delay.

Bank credit that is granted for the introduction of new equipment, for mechanization and automation, for improvement in the technology of and equipment for production, and for expansion of the output of consumer goods and of other expenditures on services to the populace exerts a great effect on developing and strengthening the materials and equipment base of social production. As a whole, the credit mechanism should be aimed at solving problems of raising capital investment effectiveness.

The policy on interest is one of the most important resources in the system of credit relationships. It ties the state's interests in with the cost-accounting interests of enterprises (and associations) that obtain credit, and it helps to strength cost accounting and the acquisition of spare monetary resources and their later use on the basis of interest and repayment. The payment for credit, the amount of which depends upon the facility for which the credit is granted, is determined by a system of interest rates, and it stimulates the profitable conduct of activity and the economical expenditure of material, labor and financial resources. Thus, for completing reconstruction and reequipping 6 or more months ahead of the established deadline, the interest rate for the entire period of the credit granted is cut in half, or by 25 percent for less than 6 months ahead of schedule. In these circumstances, banking institutions make a resettlement for the interest that has been paid in.

When the rebuilding and reequipping of enterprises, phases, lines and startup facilities are completed on the deadlines set by the plan, 0.5 percent annual interest is exacted. If the actual date of completion of the work does not meet the plan deadline, 1.5 percent is deducted. Thus, the procedure for deductions and payments of interest for the use of credit creates for the debtors a motivation to speedily execute the planned measures and to return the sums owed on time.

Unlike direct financing, bank credit promotes a speedup of construction progress and a reduction of the time taken to reimburse the expenditures made. An important prerequisite to granting long-term credit is strict observance by contracting organizations of the deadlines for construction and introduction of capacity into operation. Thus, the specialized electrical-machinery department of the Alma-Ata Railroad-Car Repair Plant was introduced on time at a budget-estimated cost of 2,994,000 rubles. This enabled the repair of 3,000 electric traction motors for diesel and electric locomotives per year to be organized locally. Unfortunately, not all enterprises achieve the economic effectiveness that is incorporated in the computations for repaying expenditures. For example, the time norms for rebuilding the Alma-Ata Tobacco Combine were exceeded. There were large losses from this: in kind--48 billion smoking-material items, or in monetary terms--25.2 million rubles.

Exceeding construction time almost 2-fold (82 months instead of 48) is explained by serious flaws in the client's work. Among them were repeated changes of the design and budget-estimating papers during reconstruction, replacement of domestic by imported equipment (causing a reworking of the technological part of the design and an increased budgetary cost) during the operations, and inadequate consideration of the prime contractor's actual capabilities. This example is instructive. It testifies to the fact that one must not accept credit "on the off-chance," in the hope of somehow getting out of the sitation later. Accurate realistic computations and skill in organizing matters are needed. Without them, higher loan payments are inevitable.

Another example. The Alma-Ama Meat Combine's meat-processing plant has been under construction under a long-term loan since 1976. According to the original preliminary plan, the facility should have been put into operation in 1978, but, because of a change in the design and budget-estimating papers, the introduction was put off until a later date. And Almaatapromstroy [Alma-Ata Industrial Construction Trust] builders prolonged the work. As a result of this delay, there was a shortfall in kind of 90,000 tons of products, which were worth 131 million rubles. It is to be hoped that this will teach production leaders to weigh more carefully the actual potential of enterprises and to organize matters better in the future.

This is on the one hand. On the other, banks, when examining requests by enterprises for credit, should pay more attention to questions of the economic desirability of the measures that are intended through the credit and to checking the authenticity of the feasibility study that has been presented and the potential for insuring timely recoupment of the expenditures made to support the forthcoming operations with the appropriate documentation and material and labor resources. It is obvious now, of course, that in solving the question about financing reconstruction of the Alma-Ata Tobacco Combine and the meat-processing plant, the bank's workers should have carefully analyzed the contracting organization's capabilities for performing the construction and installing work, and then, possibly, there would not have been such a setback of the date for introducing the capacity.

It is very important to make joint checks of the expenditure of funds at all the ensuing stages of bank monitoring. To check on whether the money is being used in accordance with the intended purpose, just how effectively it is being used what kind of progress is being made in the construction and installing work, how well the schedule for production work has been coordinated, and so on. An advantage of the credit method is that all enterprises and facilities are subjected to a check, unlike the selective checks made when construction is performed under budget grants. Such a procedure will enable progress in assimilating the credit granted to be studied in more detail and measures to be taken more flexibly for further speeding up the assimilation of capacity.

It should be noted that despite the rapid pace in expansion of the sphere of long-term credit, its share in financing sources still remains insignificant. One of the causes is the existing practice of intraindustry redistribution of profit and of depreciation allowances, which enables money to be sent to those enterprises that do not have sufficient funds of their own. This is done instead of getting bank credit. Other restraining factors are the unjustified restrictions on the issuance of credit for the reconstruction and expansion of enterprises that are low in profit or that operate with planned losses, when the banks do not consider the increased earning power of these enterprises after the capital expenditures are made. Also, low quality of design and budget-estimating papers prevents an expansion of the sphere of credit. When the budget-estimated cost is stated below the actual requirements, which happens, incidentally, very frequently, the enterprise that receives the long-term loan turns out to be unable to fulfill its commitments to the bank and to liquidate the loan on time. It is understandable that many managers show a restrained attitude toward acquiring bank credit because of this.

The important role of banks' granting credit is emphasized in the decree of the CPSU Central Committee and the USSR Council of Ministers, "On the Improvement of Planning and Strengthening of the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality." In particular, it is planned, beginning with the 11th Five-Year Plan, to convert to financing the construction of facilities continuously throughout the whole construction period on the basis of the list of construction projects. This continuity is to be achieved precisely with the help of credit. A gradual conversion also will be made to the erection of facilities by the prime contractor through credit for the full cost of construction. Together with this, it is also planned to make payment to design organizations for designs that are completely finished and accepted by the client. Clearly, designers' expenditures should in this case be covered not only through their own working capital but mainly through bank credit. Such a procedure will promote the issuance of designs of high quality in the shortest possible periods. Supplying enterprises will make use of credit more widely.

A rise in bank credit effectiveness and an expansion of its sphere of action is an urgent national economic task. Ahead is major work in determination of the most desirable areas for credit investment, more exact definition of the sources for liquidating grants that have been obtained, the effective application of economic sanctions, and the granting of privileges to an enterprise that is granted credit. And it is necessary to undertake this work more energetically today.

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ECONOMIST SAYS UZBEK CAPITAL CONSTRUCTION MUST AIM AT FINAL RESULT

Tashkent EKONOMIKA I ZHIZN' in Russian No 11, Nov 80 pp 74-77

[Article by Z. Salokhiddinov, senior scientific worker of NIEI [Scientific-Research Institute for Economics] under UzSSR Gosplan: "The Indicator Is Based on the Final Result"]

[Text] Capital construction is a leading branch of the Uzbek SSR's economy. More than 13.3 percent of the republic's national income is created by this branch. Our state prime contracting construction and installing organizations exceed one and a half thousand in number, and they do almost 4 billion rubles' worth of work each year, 1.75-fold more than in 1970.

However, as was correctly noted at the November 1979 CPSU Central Committee Plenum, the successes achieved would have been still more meaningful if bottlenecks and the existing disproportions in capital construction could have been eliminated. These are, primarily, the dispersion of efforts and resources over numerous jobs, a low share of progressive forms of the reproduction of fixed capital, production program fulfillment that is not always complete or rhythmic, construction time that exceeds the standards and plans, and growth in amounts of uncompleted production. A number of other problems that are linked with the planning, organization and management of capital construction also should be solved.

Suffice it to say that at present only one-third of the jobs are put into operation by the deadlines established by the standards and plans. Moreover, a systematic increase in uncompleted construction is being observed. It averages more than 7 percent per year. As a result, the funds frozen in uncompleted construction exceed the annual amount of capital investment. And, while capital construction effectiveness with respect to national income during the Ninth Five-Year Plan was 2.2 percent higher than during 1966-1970, it has now been reduced by more than one-third. In other words, while national income grew by 0.183 ruble per ruble of capital expenditure during the Ninth Five-Year Plan, it is now only 0.122 ruble. And with capital investment utilization at the 1971-1975 level, the republic could have obtained an additional increase in national income in the amount of 925 million rubles.

This is why the decree of the CPSU Central Committee and USSR Council of Ministers, "On the Improvement of Planning and Strengthening of the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," has become so timely.

The decree stipulates that the main factor in improving construction affairs is conversion to stable five-year capital construction plans. Beginning with the 11th Five-Year Plan, it is contemplated approving a plan that is completely balanced with the resources and capacity of construction organizations, broken down by year. And the development of such plans should rest on that provision of the decree under which not the amounts of capital investment and construction and installing work will be approved for the 11th Five-Year Plan but ceilings thereon for ministries, agencies, associations and enterprises. Thus the amount of capital investment based upon the main planned and evaluative indicator becomes a resource. The ceilings established by the state for the five-year plan will not be changed during the plan years.

An important reserve for raising capital investment utilization effectiveness is the completion in 1981 of the conversion to settlements between clients and contractors for completed construction and the turnover for operation of enterprises, complexes, phases and facilities that are due for startup in accordance with the budget-estimated cost of the construction commodity product.

As conversion is made to the new settlements procedure, the clients' issuances of advances to contracting organizations for expenditures for unfinished performance of construction and installing operations will cease. The contracting organizations will cover their expenditures through bank credits, right up to the turnover of the jobs for operation. And if in practice cases will be observed where the planned construction time is exceeded, then higher interest will be imposed for the use of the loan. Thus, construction organization activity will be oriented to the introduction of facilities into operation.

The clause of the decree that introduces the procedure under which USSR Stroybank and USSR Gosbank have the right to finance construction projects and jobs only where approved design and budget-estimating documents and working drawings are on hand by 1 July of the year preceding the plan year is qualitatively new. This procedure should be introduced in 1981. Under the existing situation, design and budget-estimating documentation should be presented no later than 1 September of the year before the plan year. Consequently, the indicated decision, which advances the date for presenting the required papers by 62 calendar days, will enable more valid planning decisions to be adopted.

This is not the only advantage of the innovation. With the strict observance of deadlines for presenting design and budget-estimating documentation, it will enable the supplying of materials and equipment to be improved, for indeed this is a most vulnerable link in capital construction. The fact is that, under the established procedure, orders for material resources, including equipment, are, as a rule, presented to the corresponding organizations in the first quarter of the year preceding the plan year. Lack of the required initial papers by that date necessitates that orders be made up on the basis of the data of similar type jobs. Such an information source, unfortunately, cannot be complete and authentic enough.

Cutting by 2 months the time allowed for presenting design and budget-estimating papers will improve the balancing of resources and the requirements of construction subunits when orders for raw and other materials and equipment are being justified. It is desirable simultaneously to intensify work on creating a system of scientifically sound technical and economic norms and standards for requirements for material resources. NIEI under UzSSR Gosplan has definite experience in developing such norms for equipment, and the same is true for analogous institutions and organizations for other types of material resources.

A standards base is a reliable planning tool. Thus, the norms that NIEI under UzSSR Gosplan has worked out for requirements for such scarce types of equipment as integrated power switchboards and high-voltage and power transformers have improved the degree of validity of orders and settlements for requirements and the supplying by the republic's holders of capital of given types of equipment.

It is generally known that construction workers have no special desire at present to undertake work associated with reequipping existing enterprises with machinery and rebuilding them. The primary causes of this are not the whims of the builders or the caprices of some managers but inadequate flexibility of the economic mechanism. The fact that the economic indicators of the construction organizations are degraded when executing the indicated types of work needs no additional argument. Suffice it to say that, according to the specialists' calculations, the labor intensiveness of operations is increased by at least 25 percent when rebuilding existing enterprises. This is why the decree stipulates that the prerequisites for expanding the work to reequip enterprises with machinery and to rebuild them be created, particularly material incentives for the workers of construction, installing and design organizations, as well as of the client production associations (or enterprises), for carrying out the indicated types of work.

It must be presumed that work to reequip and rebuild now will be entirely profitable for the builders. And, under these circumstances, the creation in the republic of cost-accountable construction and installing subunits that specialize in this work is desirable. Of the Tashtraktorostroy [Trust for Construction of the Tashkent Tractor Plant] type.

As is known, depreciation deductions, especially that portion of them that is intended for the full restoration of the fixed productive capital, are an important source for the reproduction of fixed capital. In considering this, the decree recognizes that it is desirable to place 10-50 percent of the deductions intended for the full restoration of capital into the production development fund, and to earmark the remainder for the technical reequipping and reconstruction of existing enterprises. Along with this, ministries, agencies and industrial associations have been granted the right to create through depreciation deductions a reserve of funds that are intended for overhaul. Thus the interests of those production associations and enterprises whose in-house funds are not adequate for executing overhaul are considered. These interrelated measures undoubtedly will lead to a rejuvenation of existing and the forming of progressive fixed capital, and, consequently, to an increase in capital investment effectiveness.

The decree recognizes that when developing plans for economic and social development, a correct determination must be made of priorities in the development of branches of the economy and of economic regions, in order to insure progressive changes in the national economy's proportions and to raise the effectiveness of capital investment and of all social production as a whole.

The practical solution of this problem in the Uzbek SSR will require that a number of standard-practical and organizational measures be implemented. The appropriate scientific-research organizations should be charged with work to improve methods for planning the distribution of capital investment, primarily the method of establishing the priority for the subsequent inclusion of facilities, construction projects and enterprises in capital construction plans. And later, development of a method for ranking jobs on the basis of the maximum norm (coefficient) of their effectiveness.

The composition of expert commissions that review the establishment of priorities for facilities must be strengthened, paying attention to representation on the commission of personnel who represent national-economic, branch-of-industry and territorial and regional interests. And, finally, a balance in the amount of capital investment, in material, financial and labor resources, and in the production capacity of construction organizations, not only for the plan period but also for the long term--for the next 10-15 years, that is, according to the principle "from the far to the near," "from plans for the long term to plans for the short term," is called for.

As has been noted, the main evaluative indicator for construction and installing organization activity will be the results of carrying out tasks for introducing production capacity and facilities into operation, the realization of construction commodity output, and growth in labor productivity and profit.

The recommended indicators have undergone experimental checking in a number of the country's construction ministries and agencies. A preliminary analysis of the experiment's results has indicated the need for a creative approach to realizing the tasks advanced by the new decree.

For example, while the Lithuanian SSR Ministry of Construction was fulfilling the construction commodity output plan by 101 percent in 1977 and by 105 percent in 1978, the profit plan was carried out, respectively, by 77 and 80.6 percent. In recent years a trend toward a reduction in the total profit volume has been observed. Thus, the plan profit for the ministry in 1978 was only 40.6 percent of the plan profit for 1973, almost a 2.5-fold reduction in 6 years.

The factors that explain this should include change in recent years of prices for some construction materials--metal, brick, reinforced-concrete articles and other articles--at a time when budget estimates for construction facilities were made up on the basis of prices that were approved in 1969. A second cause is that sums paid to the bank as interest on credit for the amount of uncompleted construction work rose. And, as a result, the situation became complicated for the ministry, since the profit plan for 1978 did not cover the planned expenditures. In other words, there was no provision for self-reimbursability.

Another example: Belorussian SSR Minpromstroy [Ministry of Industrial Construction] subunits, while overfulfilling the construction commodity output plan in the first 4 years of the current five-year plan, did not put into operation 80 large facilities specified by the same plan. Such a failure is explained by the fact that during the construction of many facilities their original cost was greatly increased.

These examples will convince you still more of the correctness of L. I. Brezhnev's pronouncement: "The economy is a complicated and dynamic organism, the development of which in and of itself constantly engenders new problems."

Intensification of the investment cycle plays an important role in raising the effectiveness of capital investment and capital construction. This cycle can, in general, be broken down into three periods: design, construction and assimilation.

The experience of other countries and many years of practical activity have shown that actually design and assimilation can and should be conducted during construction. All the measures for the timely and complete assimilation of the designed capacity should be carried out by the design and construction organizations jointly with the clients during the reproduction period: during design, during the execution of construction, and during the testing of the equipment and the startup and setting-up operations. In world practice, there is, in general, no special "assimilation" period. The latter is restricted to a short-lived startup period, which, as a rule, is combined in time with the concluding stages of construction.

And in our environment of socialist management, of mature production relationships for the design and construction "assembly line," not simply the materialization of resources and the document accepting the facilities but capacity that is ready for operation at the designed regims should be consummated. But still, existing norms require the assimilation of new capacity at large enterprises: on the order of 50 percent in the first year, 70 percent in the second, and 90 percent in the third.

As we see, for 3 years the planned losses from the incomplete assimilation of facilities newly introduced into operation have been reaching an average of 30 percent of their full capacity, and these losses are increased still more when the standard periods are exceeded.

In our view, the reproduction and use of new capacity on a "preferential" basis dampens the ardor of both the builders and the clients.

Work "based on small turnover" engenders numerous factors that are difficult to consider and that lead to considerable disproportions in the economy. Moreover, such a practice often leads to clients' accepting facilities with much unfinished work at the end of the year, placing their hopes on the "period of assimilation."

But the main thing is that the state remains by far at least a three-fold loser. This is the result of, first, awards to designers and builders for fulfilling work volume according to the "gross"; second, additional unforeseen spending of funds and of time to eliminate deficiencies; and third, a shortfall of the planned amount of product and of national income.

In our opinion, the gradual abolition of standards for assimilation could intensify considerably the investment process, raise effectiveness in the use of capital investment and fixed capital, and thereby accelerate the planned pace of social and economic development of the Uzbek SSR's economy during the forthcoming years.

The main reference point at which all measures now being taken to improve planning and the management mechanism in capital construction are aimed is the most rapid achievement of final results in the form of a concrete number of new products and new services. Capital investment now will be planned precisely for these conditions. And only under this condition will it be used zealously and rationally.

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CONSTRUCTION

DEVELOPMENT OF CONSTRUCTION COMPLEX OUTLINED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 1, 1981 pp 111-115

[Article by B. Kostrikov: "The Construction Complex as a Part of the National Economic Complex and Patterns of Its Development"]

[Text] The role of capital construction in the country's economy and in raising the prosperity of the people is growing more and more. In the 10th Five-Year Plan 125 billion rubles of capital investments were annually assigned to economic development, which is 2.6-fold more than was spent in the entire Fourth Five-Year Plan. It is not just new construction which is being done on a larger scale, but above all reconstruction, expansion and retooling of enterprises and capacities. Such investments of resources are making it possible to solve the problems of the economy in a more interrelated fashion and so as to take the future into account.

In the sixties and seventies profound changes took place in capital construction on the basis of the introduction of industrialized building methods. The process of assembling and erecting large-sized components and assemblies manufactured under off-site conditions began to be accomplished; there was a rise in the level of mechanization of construction, including full mechanization.

Construction work became more concentrated and specialized. In 1979 55 percent of state prime contractors and assembly organizations were specialized and 45 percent were general construction organizations. The specialized organizations had a share of 62 percent in the work done, while their share in 1961 was 48 percent. The high level of specialization led to the expansion of production relations constituting cooperative arrangements among all participants in construction. Combination within the framework of housing construction combines, plant combines and rural construction combines has recommended itself as an effective organizational form in construction.

Production and economic relations between the construction sector and other sectors of the economy have become more complicated and have grown quantitatively; at the present time more than 70 sectors and industries are furnishing material resources to construction. The material and technical base of the sectors and industries on which the state of affairs in construction depends has become stronger. A system has taken shape for the training and retraining of this sector's personnel.

All of these profound changes which have taken place in construction under the impact of scientific-technical progress and also the substantial augmentation of capacities of the construction industry, the building materials industry, construction and road machinebuilding, and project planning and surveying organizations; and development of relations among the sectors and industries supplying construction has led to the formation, within the framework of the unified national economic complex, of an intersector construction complex which to a great degree has a decisive impact on social production and the rise of its efficiency.

The construction complex can be described as an integrated set of sectors and industries (subsectors), production groupings and organizations which is characterized by close and stable economic, organizational, technical and technological ties and by functional unity in attainment of the end result and which achieves simple and expanded reproduction of fixed productive and nonproduction capital in the form of a part of the means of labor (buildings and installations) within the framework of the national economic complex.

The term used in the economics literature is the capital investment complex.* In addition to the construction industry, the building materials industry, the building fabrications and components industry, and other industries, it also includes those machinebuilding industries which manufacture technological, transport and other specialized equipment for construction sites and also certain production groupings in ferrous and nonferrous metallurgy, the chemical industry, the timber, lumber and woodworking industry, and so on. But this term is not identical to what is meant by the construction complex.

The organizational identification and shaping of the construction complex makes it possible even in the very near future to make the transition from sectoral planning and management of construction to planning and managing the complex as a whole. In this process relations between construction and other sectors of the economy related to it move to a higher qualitative level: they now constitute the relations of the latter not with the individual construction sectors and industries, but with the system they comprise within the framework of the construction complex.

The term used in the literature is the construction complex, though the structure given for it is not adequately documented and substantiated. For instance, A. Panchenko identifies the general-purpose industrial construction complex; that is, he does not include the specialized forms of construction, but includes only organizations doing general industrial construction. As for the specialized types of construction (transport, fuel and energy, mining, public works, rural, and so on), in the opinion of that author, they should be attached to the respective intersector complexes.** It is evident that the integration of the set of construction sectors and production groupings that has taken place in history is being underestimated here.

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* Krasovskiy, V., "The Investment Complex: Planning and Potential," VOPROSY EKONOMIKI, No 1, 1979.

** Panchenko, A., "Mezhotraslevyye kompleksy i tselevyye programmy ikh razvitiya" [Intersector Complexes and Target Programs for Their Development], Novosibirsk, Nauka, 1979, pp 69 and 91.

In our view the level of differentiation and integration achieved in production justifies and necessitates the following definition of the makeup of the construction complex. The construction industry proper is its main part; this is the sector which actually does the construction work on the basis of thorough intrasector specialization in erecting components and fabrications, installation of manufacturing equipment, electrical work, plumbing and other types of specialized equipment, incorporating it into the end product of construction.

Startup and adjustment operations are an important stage in the process of reproduction of fixed capital. Since they are essentially an extension and continuation of construction work, it is advisable to include startup and adjustment organizations in the construction complex.

The building materials industry and the building fabrications and components industry (an industry composed of diverse parts) are organic parts of the construction industry. As for including other industries and production groupings, here one should concur in the opinion of those authors who propose as a criterion the level of specialization and concentration: stated specifically, if more than 50 percent of their output is consumed in construction. So, taking into account that construction and road machinebuilding, production of equipment for the building materials industry, and the manufacturing of glass for construction and industrial glass have close relations with the construction industries, to which they mainly supply their products in the form of various machines, equipment, machinery and fixtures, it is advisable in our view to include these industries in the construction complex.

Machines and machinery, various materials, machine tools and equipment delivered to construction sites through cooperative arrangements with enterprises in heavy machinebuilding, ferrous and nonferrous metallurgy, the timber and lumber and woodworking industry, the chemical industry and other industries are used in building structures and capacities. These deliveries do not have an essential impact on the makeup of the construction complex.

The construction complex does include project planning organizations which in accordance with their specialization draft project plans and estimates for new construction, reconstruction and modernization of industrial buildings and installations, housing, and also enterprises and institutions in the consumer service sphere.

It is well known that a highly developed infrastructure is an indispensable condition for the efficient functioning of material production. We share the point of view of those scientists who feel that it includes not only transportation, communications and other sectors, but also science, scientific-technical information, and the training and retraining of personnel. This makes it possible to break down the infrastructure in the construction complex and include in it the following: scientific research organizations working on the problems of improving the organization of construction, of increasing the reliability and lengthening the service life of products and fabrications, buildings and installations, and on the problems of reducing their materials intensiveness; the network of higher and secondary specialized educational institutions, vocational and technical schools and courses for improvement of qualifications of construction personnel.

The sectors and industries included in the construction complex can be divided into four spheres depending on their functional purpose in the construction process.

The share of the first sphere--the construction industry proper--was as follows in the national economy in 1979: about 10 percent of the gross social product, approximately 11 percent of the national income, more than 10 percent of the workers and employees (third place after the industrial sector and agriculture), and about 5 percent of fixed productive capital.*

The second sphere--the building materials industry, the building fabrications and components industry, and also construction and road machinebuilding and production of equipment for the building materials industry--furnishes almost 3 percent of the gross social product, concentrating more than 3 percent of fixed productive capital and 2.5 percent of the average annual number of workers and employees.

The third sphere of the construction complex comprises organizations which do project planning and surveying and those which conduct surveys. The value of the work they did in 1979 exceeded 2.8 billion rubles. In recent years about 80 percent of the project planning and surveying work has had to do with industrial construction, while approximately 20 percent had to do with housing and public works construction.

The fourth sphere is the complex's infrastructure. This consists of R&D organizations, higher specialized educational institutions, schools for vocational and technical education, and courses for training and retraining personnel.

The number of students of higher and secondary specialized educational institutions in the 1979/80 academic year and the number graduating in 1979 in construction specialties were 840,700 and 163,500 persons, respectively, or about 8 percent of all the students graduating from VUZ's and tekhnikums in the country. In the system of vocational and technical education more than 600,000 skilled construction and assembly workers were educated in the 1979/80 academic year, i.e., more than one-fourth of the total number of specialists graduating from industrial and technical schools.

The construction complex is one of the largest and most important intersector complexes. It comprises a sizable portion of fixed capital and serves as a powerful instrument of scientific-technical progress throughout the economy and is conducive to faster development of new regions, correct location of the productive forces, and optimum development of intersector proportions. Construction also has a large role in our country's international cooperation.

In defining the main lines of development of the construction complex in 10-year prospective plans (with a breakdown by 5-year periods) and also in the 20-year comprehensive program of scientific and technical progress consideration should be given to the patterns of its development and measures should be envisaged which would guarantee attainment of the best end result. It should be borne in mind in this connection that certain of the patterns reflect the specific nature of construction since the time of its emergence as an independent sector.

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* Here and hereinafter the figures on the first sphere and on the entire complex do not as given include organizations for startup and adjustment.

In the economics literature there has been detailed examination of such patterns as the rise of the relative share of ready-made fabrications and components in the sum total of physical resources of construction, a faster growth rate for the output of the building materials industry than for construction and installation work, etc. But not enough has been done to reveal the complexity and dynamics of the development of capital construction and of sectors and industries related to it. The studies done by economists have not fully reflected the patterns which have begun to be evident in the stage of formation of the construction complex and which characterize its makeup and structure and functional peculiarities.

In our opinion one such pattern is the growing dependence of the results of construction on the degree to which the volume of contract work is in balance with the capacities of construction organizations and on the level of development of the material and technical base of the building materials industry, the building fabrications and components industry, construction and road machinebuilding, and project planning and surveying organizations.

Many difficulties in capital construction have come about because the volume of contract work was not consistent with the capacities of construction organizations. It was not only shortcomings in planning that brought this about. In recent years the specialization of construction ministries in many regions and the geographic location of their construction organizations have ceased to conform to the sectoral and geographic structure of construction. Often the volume and structure of construction are made dependent on the available capacities, and not the other way around.

The decree of the CPSU Central Committee and USSR Council of Ministers entitled "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" points out that beginning with the 11th Five-Year Plan 5-year capital construction plans are to be approved (with the assignments broken down by years); these plans are to be balanced not only against the physical, labor and financial resources, but also against the capacities of construction and installation organizations. The writing up of the descriptive certificate or passport for every production association (enterprise) will make it possible to plan capacity so as to take into account possible changes during the year rather than on the basis of the level already achieved.

The results of construction depend in large part on the extent to which the planned volume of construction work is linked to the capacity for production of building materials, fabrications and components not only on the scale of the entire country, but also on that of the regio[illegible] so as to take into account centralized deliveries for each union republic, economic region, regional industrial complex, kray and oblast. For a number of reasons, including objective reasons, it has not always been possible to achieve close linkage. In accelerated development of new regions, then, in carrying out large construction programs and also in performing sizable amounts of specialized work broader use should be made of mobile construction organizations and of the tour-of-duty and field-crew methods of building structures and capacities. Creating normal working and living conditions for construction workers and their financial and nonfinancial incentives have become extremely important.

The development of the capacities of construction and road machinebuilding must correspond to the increasing volume of contract construction work. That industry confronts the task of producing equipment that is more productive and has the necessary attachments for performing various types of specialized operations so as to take into account the specific nature of construction in different regions, Siberia, the Far East and the south of the country above all.

It is important to take into account the requirements embodied in project plans and estimates in determining the volume of construction and in carrying out the set of measures in preparation for performance of these assignments in construction organizations and enterprises manufacturing the necessary materials, fabrications and parts, as well as construction machines and machinery. Improvement of the drafting of project plans and estimates depends in large part on the material and technical base of project planning and surveying organizations, which is in need of substantial improvement. We are referring above all to the introduction of full mechanization and computerization in project planning work, including extensive use of computers and office and business machines.

It is becoming extremely important, then, to implement the decree of the CPSU Central Committee and USSR Council of Ministers on improving the economic mechanism, which specifically provides that USSR Gosplan shall draft and approve 5-year plans of project planning and surveying work, of development of the network and of the material and technical base of project planning and surveying organizations (with assignments broken down by years) so that they are linked with capital construction plans.

It is a complicated process to achieve consistency in plans of contract work, to develop the capacities of the construction industry proper, and to strengthen the material and technical base of the building materials industry, the building fabrications and components industry, machinebuilding and project planning and surveying organizations. This process embraces many ministries and departments which, as experience has shown, do not always arrive at the optimum solution. There is a need, then, to enhance the responsibility of USSR Gosplan, USSR Gosstroy, and planning and construction entities of soviets of people's deputies for the scientific level of state capital construction plans and for preparing all the branches of the construction complex to fulfill them.

The second pattern in development of the construction complex which has been operative since the moment of its emergence is, in our view, the rise of the capital-labor ratio, which is the basis for increasing the efficiency of capital construction. Construction organizations at the present time do have powerful equipment and more than 1 million trucks.

Yet the output-capital ratio is dropping in construction. There are a number of reasons to explain this situation. For example, automation and mechanization of production objectively increase the value of the fixed capital of construction. In addition, periods for attaining rated capacity at newly activated facilities often exceed the standard time allowed. Capital intensiveness rises because the stock of machines in construction is getting older and also because there is not an adequate amount of specialized equipment and power tools. One reason for this is expansion of the scale of construction in the new regions of Siberia and the Far East, where capital intensiveness of production is higher than in the west and in the center of the country. To a considerable degree the drop in the output-capital ratio has resulted from the low shift coefficient and a low level of utilization of fixed productive capital.

The rise of the capital-labor ratio will continue in the long run in the construction industry proper and also in the construction complex as a whole. This has to do with two main circumstances. First, the absolute level of the capital per worker in the construction complex is considerably lower than in the industrial sector. In 1971 it was about 6,000 rubles per worker, including more than 4,000 rubles in the construction industry proper, whereas in the industrial sector it exceeds 13,000 rubles.

Second, the construction complex faces large tasks in developing and building new production operations and in optimum location of the productive forces in the country (development of the new regions of Siberia and the Far East) and in formation of an advanced infrastructure. In view of the shortage of labor resources, in order to perform those tasks there is a need to apply systems of up-to-date machines on an ever greater scale, which will make it possible to choose optimum sets of machines and machinery for erecting buildings and installations in accordance with their respective technical peculiarities.

The third pattern in the formation of the construction complex is that production of the output of its second sphere has been developing faster than the volume of construction and installation work. Over the period 1966-1979, according to data of the USSR Central Statistical Administration, the growth rates of gross output both in the second sphere of the construction complex as a whole and also in its individual industries, were higher than the growth rates of the volume of construction and installation work.

The pattern of the faster development of the building materials industry has been studied in detail in the economics literature. It is also obvious that the production of building fabrications and components has been developing at a faster pace, since almost three-fourths of its products are manufactured by the building materials industry. The growth rates of the production of building materials and of building fabrications and components depend directly on development of the industry manufacturing equipment for the building materials industry, whose growth rate exceeds that of construction and installation work by the largest difference.

Technical progress, the growing volume of construction, and the development of new regions are dependent in large part on both the quantity and also quality of machines and equipment manufactured by construction and road machinebuilding, which is also typified by fast growth rates.

Thus the fact that the second sphere of the construction complex has been developing faster than the first over a rather lengthy period constitutes a stable tendency and emerges as a pattern. If we wish to describe this pattern in quantitative terms, we can take the indicator of the difference in growth rates, defined as the ratio of annual growth rates of the gross output of the second sphere or of its individual industries to the volume of construction and installation work accomplished by the industries in the first sphere.

Placement of the construction complex on a theoretical foundation and identification of the patterns of its development afford the possibility of solving the problems of planning and managing the complex and overcoming intrasector boundaries. Uniformity of the forms of planning within the framework of the construction complex is becoming a most important condition in carrying out long-term intersector and sectorwide construction programs and is creating the necessary prerequisites for attaining rapid growth rates, optimum structure and proportional development of all sectors and industries (subindustries), production groupings and organizations in the complex and for achieving the final product of construction. This approach is also valid for regional construction complexes (consideration being given to the specific nature of each of the regions).

Inclusion of startup and adjustment organizations in the complex is taking on fundamental importance. It would seem best for the startup and adjustment process to be performed by appropriate specialized organizations under contract with the general contractor even before the projects are turned over for operation, rather than under contract with the customer after he has accepted the production capacities. This implies a change in the traditional concept of the end product of construction, which should be seen as facilities and capacities manufacturing products and rendering services, rather than as the same projects and capacities which have merely been prepared for that operation. Production capacities should already be running when they are put into service.

It is important to achieve a more uniform pace of production throughout the entire length of the construction cycle, to reduce the time it takes to erect structures and capacities, to reduce the volume of construction in process and on that basis to achieve the best final results for construction and for the national economy as a whole.

The intersector construction complex, its makeup, its structure, its economic mechanism and its patterns of development require further comprehensive and thorough study and practical improvement, which in the final analysis will have a beneficial effect on the efficiency of capital investments and on the state of affairs in construction.

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CONSTRUCTION

PROGRESS NOTED IN CONSTRUCTION OF NUCLEAR POWER PLANT

Leningrad STROITEL'STVO I ARKHITEKTURA LENINGRADA in Russian No 2, 1981 pp 6-9

[Article by I. I. Semykin, director of the Sosnovyy Bor Construction Administration, hero of Socialist Labor, delegate to the 26th CPSU Congress, and B. K. Lebedev, party committee secretary: "Achieving Planned Capacity"]

[Text] On the shores of the Gulf of Finland, 70 kilometers southwest of Leningrad, construction is nearing completion on one of the largest projects of its kind in the country or in Europe--the nuclear power plant imeni V. I. Lenin. One can hardly overestimate the national economic significance of this project in increasing the electric power supply for the Soviet economy. With four reactors, each of one billion watt capacity, the Leningrad Nuclear Power Plant (LNPP) is the first in a series of nuclear plants being built with the RBMK-1000 reactor, designated to provide electric power to meet the demands of quite a significant portion of industry in the European USSR. The CPSU Central Committee and USSR Council of Ministers are devoting a great deal of attention to construction of the LNPP. The project is under the constant personal supervision of G. V. Romanov, member of the CC CPSU Politburo and first secretary of the Leningrad party obkom.

All of this imposes an exceptional responsibility upon the LNPP builders. A large workers' collective of engineering and technical personnel of the Sosnovyy Bor Construction Administration (SBCA) responded unanimously to the CC CPSU resolution "On Socialist Competition in Honor of the Noteworthy Convening of the 26th CPSU Congress" by joining in a 26-week intensive pre-congress watch [vakhta]. Competition results were summed up weekly in the subunits and at sessions of the central staff of the construction project's party committee.

The basic content of the increased socialist obligations undertaken by SBCA workers is completion of all construction and installation projects, and all start-up and adjustment work on the power plant's fourth block, as well as providing for the commissioning of still another reactor--a million-kilowatt one--by the opening of this forum of the country's communists. With the introduction of this reactor, the LNPP will reach a planned capacity of four million kilowatts. Completion of the assigned task requires intensified efforts not only on the part of builders. As long ago as July 1976, the SBCA collective followed the example of 28 Leningrad enterprises that had participated in building the Sayano-Shushenskaya Electric Power Station, and concluded an agreement providing for creative collaboration with 15 organizations to put the Leningrad power-producing titan into operation as quickly as possible.

An additional 24 enterprise and organization collectives in the country joined in sharing the obligations of those who originated this kind of socialist competition.

A coordination staff established under the Sosnovyy Bor party gorkom regularly sums up achievement results with respect to the collaboration agreement. The criterion for determining winners in the socialist competition is fulfillment of assumed obligations by category--groups of scientific, planning and design organizations, outfitting plants, builders', installers' and adjusters' collectives. First-place awards have been conferred repeatedly by the SBCA on MSU-90 of the special power-engineering installation trust, CIA [Construction and Installation Administration] No 1. and others.

Unfortunately, things haven't always gone right with all concerned. This applies in particular to suppliers' fulfillment of their obligations. For example, the network schedule of construction on the fourth power engineering block for 1 Dec 1980 envisaged the start of a very important stage--flushing the systems. However, certain deliveries had not been provided by power machine-building plants at this time--450 tons of turbine and station equipment piping (Belgorod), 229 accessory units (Chekhov), 221 parts of the reactor's control and protection system from the "Bol'shevik" plant in Leningrad, a great deal of equipment of a number of other designations. This lagging behind was subsequently eliminated; however, it did cause somewhat of a delay in beginning systems flushing.

As is well known, construction of the Leningrad nuclear project is being accomplished in two stages. LNPP-1 and LNPP-2, each with a two-million kilowatt capacity, comprise two power blocks each with independent, one-million kilowatt reactors, that provide power for the operation of two 500-megawatt turbines.

Each LNPP power block is an integral complex of very intricate, crucial projects. The blocks contain separate structures for the RBMK-1000 reactors and their circulation loop, auxiliary systems, and water and condensation circuits, common engine rooms for the two power blocks with K-500-65 turbines and 500-megawatt turbo-generators, stations for auxiliary equipment, fuel transportation systems, water preparation, gas cleaning, control consoles, data and computation equipment, and much more.

In this light it must be kept in mind that neither we ourselves nor anyone in the history of our native land has had the experience of erecting this kind of power-generating colossus. It is the first time we have had to solve the majority of these organizational and technological problems, taking into account the very latest achievements in nuclear power, the science of materials, and the building industry. During construction of each of the four LNPP power blocks, improvements were made in the structures, individual assemblies and systems. Deficiencies uncovered after the previous blocks had become operational were eliminated. The entire process of construction and installation, of start-up and adjustment work was improved and accelerated; the reliability of complex equipment was increased.

The dynamics of an increased rate of construction are distinctly observable in the figures that follow. Reactor room construction--to the point where the reactor's industrial structures were ready for assembly--required 31.8 months for the first power block, 20.8 for the second and 11.2 for the third; the fourth block was completed in just six months.

Prior to assembly, the reactor's structures were consolidated into units, some of which reached a weight of 600 tons. Such a consolidation permitted reactor assembly and its preparation for the start of laying graphite in the reactor space to be accomplished in 1.3 months, whereas the same operation for the previous three blocks required 6.7, 6.6 and 6.0 months, respectively. The laying of the graphite itself, and completion of all work in preparing industrial conduits for assembly in the fourth block's reactor was accomplished in 24 days; two-and-a-half months were required for the first block.

Energizing of the first set of power supply distribution equipment for the new "million-kilowatter" was accomplished at one-and-a-half times the rate for the third block.

An enormous volume of projects had to be accomplished in order to achieve this. Just to energize the new block required installation of 500 6- and 0.4-kilovolt cells, 1700 meters of bus duct, 450 modular shields and panels; 500,000 meters of cable were laid.

A labor victory here was insured by the efforts of certain installation and assembly team leaders--Bearer of the Order of Lenin V. F. Dovgiy, Bearer of the Order of Labor Glory (third degree) B. S. Sonina, senior work superintendent G. S. Lobanov, adjusters N. A. Shut' and A. A. Babaylov. The list goes on--dozens, hundreds of people have labored with inspiration.

For the first time we began widespread use of pre-cast reinforced concrete in construction of the plant's fourth block. Also for the first time, we made use of nonremovable, metal and reinforced-concrete casing in laying the monolith. Veneer paneling and decorative tiling were adopted for use. Installation personnel resorted to maximum preliminary consolidation--up to 600 tons in weight--of structural metalwork, piping and tubing and equipment installed in the blocks, a factor which had a 2.5 million ruble economic effect and enabled us to reduce the time required for systems installation by seven months compared with LNPP-1.

Widespread application of automatic and semi-automatic welding of conduits and industrial metalwork has enabled us to release almost one-fourth of our welders. On the whole, mechanized methods of welding account for 78 thousand conduit joints and 120 thousand linear meters of structural metalwork weld for the latest block.

Preliminary inspection of equipment conducted at the stage of initial assembly enabled various kinds of defects to be brought to light and eliminated more quickly. This in turn resulted in gains of up to a month in start-up and adjustment work.

Finally, a high degree of matching was achieved in construction and assembly efforts. As a result, time required for construction and installation for certain projects was reduced by 2-5 months.

A detailed network schedule formulated at the project's inception served as the basis for accurate work organization. It is thanks to this that continuous supervision of construction progress was insured.

Large-scale introduction of team contracting also played an important role. This was first applied to construction of the Leningrad nuclear power plant in 1973 with the team of A. A. Pakhalkin, Hero of Socialist Labor and USSR national prize laureate. Today 43 teams (635 people) have turned to the lower cost accounting. Whereas in 1979 projects totalling 24 million rubles were completed by contract, the 1980 figure amounted to 35 million.

The decisive factor in success is people, whose qualifications grow day by day, and who combine and coordinate several related specialties. Also important is the fact that cohesive, experience-proven collectives were formed during construction of the preceding power blocks--from individual team, section and division level up to construction and installation administration.

Thus, whereas the entire construction of the first LNPP section lasted 97 months (which is itself unprecedented in the world's experience), LNPP-2 should become operational one-and-a-half times as quickly according to the plan--in 66 months. As a result, the Leningrad project will reach its four-million kilowatt design capacity as early as the first year of the 11th Five-Year Plan.

The validity of what has been projected is confirmed by results achieved in construction of the third power block, which was put into industrial operation ahead of schedule, on 7 Dec 1979, with one 500-megawatt turbine. On 17 Feb 1980 the second turbo-generator of the same capacity became operational.

Comrade L. I. Brezhnev, CC CPSU General Secretary and Chairman of the Presidium of the USSR Supreme Soviet, offered his sincere congratulations to the collective imeni V. I. Lenin of those who built the LNPP on the occasion of their labor victory in commissioning the third power block ahead of schedule. The fact that the builders and operators of the LNPP have twice already been honored with high labor appraisals in messages of greeting from Leonid Il'ich serves as a source of special pride to these men of Sosnovyy Bor, and is inspiring them to new achievements.

Successes that have been achieved were made possible thanks to the constant concern of party and government with regard to the development of power engineering, to concentration of material and manpower resources at the decisive sections of construction, to the high level of organization and discipline, the selfless labor and creative initiative, the civic responsibility and spiritual upsurge of everyone who participated in erecting the power plant. This was facilitated by the purposeful mobilizing, organizational and political work of all sections of the project's administration, party, trade union and Komsomol organizations, their efforts directed towards spreading socialist competition aimed at reducing the time required for completion of projects and maintaining their high quality.

The project's party committee and party shop organizations paid special attention to increasing the leading role communists play in strengthening the labor force's sense of responsibility for the mission assigned, in enhancing labor productivity, and in consolidating the organization and discipline of every production collective. Extremely complex and responsible sections have been entrusted to party members. As a rule, it is communists that manage the work teams.

The Sosnovyy Bor Construction Administration collective achieved its basic, planned quotas for the Tenth Five-Year Plan by 4 Sep 1980, and in growth of labor productivity it fulfilled the five-year plan in four years--by 31 Dec 1979. Results of the All-Union socialist competition show that, in just the past year, SBCA workers were twice awarded first place and presented the challenge Red Banner of the ministry and trade union central committee. This past year 280 individuals were awarded the "Victor in Socialist Competition" emblem, and more than 300 received the emblem "Outstanding Worker in the Tenth Five-Year Plan." The project currently has eight workers who are USSR national prize laureates, and seven engineering and technical workers have been honored with awards from the USSR Council of Ministers. Everyone knows the names A. I. Kozlovskiy, A. A. Pakhalkin, V. K. Chikarev, Heroes of Socialist Labor, G. N. Mar'yasov, twice awarded the Order of Lenin, Order of Lenin Bearer D. F. Ryzhay, and other prominent individuals.

The high level of labor intensity in socialist competition is also explained by the youth of those working. The average age of line section personnel is 28-29 years, even less for workers. This is understandable--they are performing labor on a key All-Union Komsomol construction project.

It would be a serious error, nonetheless, to assert that we have no unsolved problems or bottlenecks. It is unfortunate that in any large-scale matter you just cannot avoid them.

What must be accomplished first of all is a significant improvement in the material and technical supply system, in the complete-set packaging of shipments and quality of delivery. The SBCA still does not have at its disposal a sufficient technical base of its own which would allow, for example, putting the first finishing touches on products made of pre-cast reinforced concrete and metalwork, or completing manufacture of joiner's items in sufficient variety with hardware mounted on them, etc.

No satisfaction can be derived from our achieved level of mechanization in labor-intensive projects and work requiring heavy physical efforts--plastering, earthwork in frozen soil, loading and unloading operations, and water-sealing work in particular. Things are not going favorably with regard to providing the standard set of manual electric tools and light, mechanized equipment, as well as lift mechanisms and construction rigging equipment. To our great disappointment, industry is issuing all of this in completely inadequate quantities.

Characteristically, our administration is accomplishing construction not only of the LNPP industrial units, but of the entire scope of residential construction and cultural and everyday facilities in Sosnovyy Bor as well. In the course of the Tenth Five-Year Plan we have built over 200 thousand square meters of living space, the "Tallinn"department store, two trade centers, a club with 600-seat capacity auditorium, five children's institutions (1260 spaces), two 1176-desk schools, a polyclinic to accommodate 1200, a block of the main building complex of a 180-bed hospital, a bread-baking plant, and a number of other projects. In July 1980 our builders provided the younger citizens of the city with a beautiful playground complex "Andersengrad," with a puppet theater, the cafe "Belosnezhka" [Snow White], and and a motor road. All of the units get "good" or "excellent" appraisals.

Enhanced effectiveness even in this area of our program is facilitated too by the transition to team contracting. In the construction of city projects alone, 32 of 65 work teams today are operating in the "Zlobinskiy" fashion. There are entire sections as well that have shifted to lower cost accounting (construction superintendents Ye. V. Krasnov and Yu. M. Aleksandrova).

Last year for the first time two houses were built on a multiple-contracting basis. Appropriate agreements with subcontracting organizations were drawn up for this purpose. We noticed that things went along considerably better with respect to residential construction, and construction of cultural facilities and those which provide everyday services.

Along with all the Soviet people, builders in Sosnovyy Bor discussed the CC CPSU draft to the 26th Party Congress with zeal and excitement, and introduced proposals for enhancing effectiveness and improving the quality of construction projects. We are faced with the task of implementing an intensive program, but are confident that we will be able to deal with those assignments that will be determined by the 26th congress of our party.

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BUILDING APARTMENT HOUSES WITH BKR-2 BOX MODULES

Moscow ZHILISHCHNOYE STROITEL'STVO in Russian No 12, 1980 p 10

[Article by L. M. Terekhovkina, engineer, All-Union Scientific Research and Planning Institute of Labor in Construction]

[Text] Box-module (ob"yemno-blochnoye) housing construction is undergoing ever greater development at the present time. The All-Union Scientific Research and Planning Institute of Labor in Construction has accordingly adjusted and submitted to Stroyizdat a set of charts of work occupations drafted by the Mechanical Engineering and Process Engineering Institute of the USSR Ministry of Industrial Construction, for erecting apartment buildings with BKR-2 box modules.

This set of charts consists of two parts: assembly operations in plant fabrication of the box modules (7 charts) and assembly of the finished modules at the construction site (16 charts). Advanced practical experience of the assembly work teams of SMU-7 [construction and installation administration] of the Krasnodar Housing Construction Trust and the experimental data of the laboratory of the Scientific Research Institute of the Moscow State Construction and Installation Trust and of the Central Construction Laboratory of the Krasnodar Housing Construction Trust were used in preparing the set of charts.

The standard data presented in the charts of work occupations were arrived at on the basis of observation and selection of the most efficient work methods and the use of improved tools, attachments and fixtures. According to the calculated data, introduction of these charts makes it possible to reduce labor expenditures an average of 44 percent over standard allowances. This is achieved by using a progressive method of erecting the principal fabrications "direct from the truck" and advanced work procedures; by improving the organization of work at work stations; by straightforward assignment of responsibilities among the workers of the team so as to take into account division of labor on the basis of the complexity of operations, combination of occupations, and so on. We will discuss in more detail the individual work processes that are of the greatest interest with respect to progressive know-how and organization of the workers' work.

A team consisting of two Class IV assemblers, one of whom has mastered electric welding as a second occupation, performs the operations of fabricating bathroom enclosures as the work station is organized in the chart of the work process which is being recommended. The team is one man smaller than that called for in the Uniform Standards and Unit Costs.

A special jig designed by the trust Orgtekhstroy of Glavkrasnodarpromstroy [Krasnodar Main Administration for Industrial Construction] is used in fabricating bathroom enclosures; its use together with other attachments and fixtures designed by the same trust (an adjustable screw clamp for fastening dividers, a clamp for hoisting bathtubs, a magnetic holder for additional parts), afford the possibility of cutting in half the labor spent in this process.

The bathroom enclosures are installed in the box module with an overhead crane and special attachment designed by the trust Orgtekhstroy of Glavkrasnodarpromstroy. The labor expenditures to install one bathroom enclosure are 0.36 man-hour, instead of the standard 0.5 man-hour. Progressive fixtures developed by the trust Orgtekhstroy are also used in installing the other elements of the box module: jigs for checking the diagonal of the box module, for installing the wall panel in its proper position, for checking the ventilation unit and balcony railing after installation, a jig for assembling the elements of the stairwell, etc.

	Expenditures of Labor Per Box Module, in man-hours	
Fabrication	According to Chart	According to Interdepartmental Standards and Unit Costs of Standard Research Station of Glavkrasnodarpromstroy
Inside (row) module	2.1	4.38
End module	2.4	5.15
Module of the "stairwell" type	2.7	5.49
Three-dimensional element of the elevator shaft	3.2	4.38

The second part of the set of charts for erecting apartment houses with BKR-2 box modules includes charts of work processes in placing plinth panels, inside and end box modules, box modules of the "stairwell" type, three-dimensional elements of the elevator shaft, outside wall panels, partitions, electric panels, floor/ceiling slabs of corridors, divider screens, cornice slabs, elements of the elevator shaft wall, parapet panels, roofing, floor slabs of the assembly department, and ventilation modules. In order to put maximum load on the work force and eliminate interruptions in the flow of work to assemblers up on the structure and riggers on the ground near the structure, it is foreseen that the box modules and reinforced-concrete fabrications will be placed by two cranes operating simultaneously in two sections 50.7 meters long. The necessary distance indicated in the project plan for performance of operations must be observed when the move is made to the parking place.

A team of four men is employed in placing the box modules: a Class V fabrications assembler, two Class IV fabrication assemblers, and a Class III rigger. They take a section of the house within one story for hoisting and placement. Optimum organization of the work station, straightforward division of responsibilities among the workers of the team, and the use of efficient jigs and fixtures makes it possible to achieve good results in placement of the box modules.

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CONSTRUCTION

EXPERIMENTAL HOUSING CONSTRUCTION IN MOSCOW

Moscow ZHILISHCHNOYE STROITEL'STVO in Russian No 12, 1980 p 25

[Article by V. G. Trofimov, special correspondent, Moscow: "At the Construction Sites of the Capital"]

[Text] Experimental construction has tremendous importance to developing large-scale industrialized construction of apartment buildings in Moscow. Peschanyye Ulitsy, Novyye Cheremushki, Severnoye Chertanovo and a number of other areas in the city were in their time a school of industrialized flow-line high-speed housing construction and to a great extent accounted for the subsequent achievements in this sector of the economy.

The writing of the draft plan for experimental construction in the capital in the 11th Five-Year Plan has now been completed. This is especially important on the eve of the 26th CPSU Congress, which will make fundamental decisions and will outline the strategies of our state's future development.

The plan for experimental construction in the 11th Five-Year Plan specifically calls for continuation and completion of construction of the Severnoye Chertanovo experimental residential area. Its construction will make it possible to study the social and physical environment and the organization of the life and day-to-day activities of Muscovites in the near future. It is also here that a check will be made of the advisability from the economic standpoint and the standpoint of layout of using space underground for transportation and technical services, of concentrating consumer service zones within a single complex and of other progressive project planning features.

There are plans to conduct interesting experiments in Krylatskoye--a large housing construction project. Prototypes of new types of houses built from products in the Unified Catalog will be built here. Previous series of buildings built with standardized components were assembled from the products of housing construction combines. But Krylatskoye will become an experimental proving ground for the reinforced-concrete fabrications plants of Glavmospromstroymaterialov [Moscow Main Administration of the Building Materials Industry].

A similar experiment will make it possible to make the transition to building residential buildings according to improved new designs.

There are also plans to erect in Krylatskoye an experimental 25-story apartment house of cast-in-place reinforced concrete using stock forms. In building previous high-rise apartment buildings cast-in-place reinforced concrete was used to build the foundations, rigid centers. In the 25-story apartment building in Krylatskoye casting in place is to be the dominant method of construction. The high first stories of cast-in-place reinforced concrete are intended for the location of stores and other service establishments.

The plan for experimental construction also provides for building a self-service department store using the container system, a covered market with a cupola of large-size elements combining precasting and in-place casting, a number of public buildings made from standardized products in the Unified Catalog, and other projects.

In the southeast of the capital, at the bend in the Moskva, where the village Mar'ino used to be, extensive housing construction has developed. The design calls for building five microareas with 1.4 million square meters of residential floor space here. Completion of construction is scheduled for 1982.

Work has now gone forward in three microareas--the first, second and fourth (800,000 square meters of residential floor space). The buildings here have an improved layout. Consumer service enterprises are being built here together with the apartment buildings. The social center of the three microareas will be located in Marshal Golovanov Street. A combination movie theater and concert hall seating 1,200 will be built there.

The design for developing the first three microareas of Mar'ino calls for erecting 6 school buildings and 14 preschool institutions, 2 self-service department stores, an automatic telephone office with a capacity of 20,000 subscribers, a dry-cleaning plant with self-service laundry and other trade and consumer-service establishments.

There are plans to build a bridge over the Moskva in order to improve transportation connections of this housing development. The grounds of the microareas are to be developed and landscaped.

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CONSTRUCTION

NEW BOOK COVERS PROBLEMS OF FULLY PREFABRICATED HOUSING CONSTRUCTION

Moscow ZHILISHCHNOYE STROITEL'STVO in Russian No 1, 1981 pp 29-30

[Review by Ye. P. Pankratov, candidate of economic sciences, Moscow, of the book "Puti razvitiya i sovershenstvovaniya polnosbornogo domostroyeniya" by A. M. Kosogov and R. V. Kryukov, Stroyizdat, Moscow, 1979, 288 pages]

[Text] Improving the housing conditions of the workers is one of the principal tasks in increasing the prosperity of the Soviet people. Development of fully prefabricated housing construction, which makes it possible to raise the quality considerably while reducing the construction time of buildings, as well as reduce expenditures of labor and the construction cost, has paramount importance to successful performance of that task.

Great attention has been paid to the problem of developing and improving fully prefabricated housing construction both by scientific and project planning organizations and also by housing construction enterprises, but no comprehensive solution has yet been found to the problems of project planning, architecture, fabrication and methods of plant fabrication and on-site construction work.

We should also note that so far no monograph study has been made that is uniform in its methodology and that encompasses the entire range of problems of fully prefabricated housing construction. The book of A. M. Kosogov and R. V. Kryukov "Ways of Developing and Improving Fully Prefabricated Housing Construction," in our opinion, fills this gap to a considerable extent. It is distinguished by the comprehensiveness of its approach and by its thorough and detailed treatment of the problems of fully prefabricated housing construction.

The book consists of four chapters in which a critical analysis of abundant factual material characterizing the state of affairs in housing construction, a study of the amount of work done on this problem by other scientists, and also the authors' own research serve as the basis for offering a rather well-substantiated assessment of the present level of fully prefabricated housing construction from the standpoint of social, architectural and operating requirements to be met by housing construction projects, for examining the peculiarities of fully prefabricated housing construction, for defining the main lines of its development in the near and more distant future, for analyzing the organizational and production factors that determine the efficiency of fully prefabricated housing construction, and for citing measures to improve the quality and reduce the cost of construction. The authors moreover take as their point of departure a conception that is undoubtedly correct: use of the comprehensive systems approach to the organization and management of the entire course of industrialized housing construction. At the beginning of the book there is a survey of the development of a new direction of housing construction in our country; in it the basic fabrications used in prefabricated houses, methods of fabricating them and construction methods are examined. There is also a description of the development of large-panel housing construction abroad, including that in the European socialist countries, where it has become the principal method of industrialized housing construction. It is moreover noted that the construction times for fully prefabricated buildings average 1.5-2 months shorter and their costs 10-12 percent lower than traditional methods.

One of the central places in the book is taken by the problems of setting up the "construction system" for fully prefabricated buildings so as to ensure high quality of the structures erected from the standpoint of architecture and layout and subsequent service when large-scale industrialized methods are used and the condition of optimum economic efficiency of construction is met. The authors formulate a scientifically sound concept of the "construction system," reveal its content and use the example of housing construction to present in detail the methods of evaluating different versions of construction systems on the basis of the ultimate objective of the construction process--reducing the cost and construction time while improving quality.

On the basis of a comprehensive critical analysis of the literature on this problem and also of Soviet and foreign experience, the book defines the principles for setting up a system that envisages comprehensive solution of the problems of project planning of large-panel buildings with concurrent technological preparation of production and construction. Principal attention is moreover paid in the book to those systems of fully prefabricated housing construction which have become most widespread in contemporary Soviet and foreign practice.

The book examines different building systems in large-panel housing construction, among which the dominant one is the system with transverse load-bearing walls. We should note that increasing the spacing of the transverse walls makes it possible to vary more widely the layout designs of apartments in accordance with functional requirements.

The authors analyzed the problems of economic substantiation of the system of maximum parameters of mass-produced housing components (maximum component dimensions and weight), which determine the principal characteristics of the lifting capacity and size of the stock of machines and machinery for plant and on-site production and the system of modular coordination of architectural, layout and structural solutions of the buildings and the principles of standardizing products to be used in construction. The procedure for selection of a system is based on comparing the costs of introducing the new parameters with the economic benefit it affords.

The solving of important practical problems is also the direction the authors pursue in their treatment of project planning methodology for fully prefabricated buildings, standardization and conformity to official standards of the parameters of products for use in construction and of the plant and on-site facilities, and of determination of the production capacities of large-panel housing construction enterprises. An important and fundamental distinctive feature and virtue of the method proposed in the book is that it makes it possible to comprehensively evaluate the state of a combine's industrial capability and determine production capacity and capability of the housing construction enterprise as a whole. This approach ensures balance between the combine's industrial and construction parts, full utilization of the capacities of the industrial capability and smooth operation of all its subdivisions.

Sizable space is devoted in the book to treatment and justification of the contents of the technological passport of the enterprise, which would state data on its capacity, the parameters of its production buildings and equipment, its production processes, its technical-and-economic indicators, and other information. It is especially necessary for project planners to have this information, since present-day project planning of buildings cannot be done without knowing and taking into account the laws of production of fabrications and components and also construction technology.

The monograph sets forth the methodology for comprehensive project planning, which solves the problems of laying out buildings, of choosing fabrications, of their compatibility, of methods of plant production of components and of the construction of buildings; and the available experience in this kind of project planning is examined.

It is also important to note the interrelationship the authors establish between the system of modular coordination of component dimensions and the conformity of project plans to construction technology. The system of modular coordination, especially when a consolidated module is used, reduces the list of component items, makes the list more definite and stable, which is especially important for plants with a flexible technology. In this connection a study is made of the possibility of further use of automatic equipment, including computers, in the project planning process.

The book draws a very important and correct conclusion concerning the inefficiency of narrow specialization of a number of housing construction plants because of the higher shipping expenses of transporting the fabrications. The authors consider the main direction for improving the production of diverse reinforced-concrete fabrications, of the transition from manufacturing certain fabrications to others in order to achieve architectural expressiveness of apartment buildings to be the organization of a flexible technology for housing construction which would ensure the manufacture of a broad list of construction fabrications and components. The monograph defines what it means by a flexible technology and the problems it is to solve, examines the problems of organizing and managing plants operating according to that technology and also the requirements which the flexible technology imposes on technological processes, equipment and project planning. The principles governing introduction of a flexible technology at enterprises and on production lines are also illustrated. We must concur in the author's optimistic evaluation of the prospects for further development and introduction of a flexible housing construction technology, which must become the principal method at housing construction enterprises for making fabrications and components for large-scale housing construction.

One of the most complex problems in fully prefabricated housing construction that are taken up in the book is conformity to standards and standardization of the products of housing construction plants so as to promote higher efficiency and quality of large-scale construction. The research done by the authors shows that standardization and conformity to standards must extend not only to project planning and the manufacture of products, but also into the sphere of construction itself. In this connection it is established that it is effective to standardize only the large-scale elements of fully prefabricated housing construction as defined in catalogs, while isolated components such as balcony railings, entrances, and architectural inserts, can be manufactured under one-time orders. At the same time the authors rightly note that work on standardization is not yet comprehensive enough and the decisions being made are not being subjected to the necessary economic assessment.

The main lines and strategies of improving the production capability of fully prefabricated housing construction are further elaborated in the book. It defines the principles for developing and selecting an interrelated set of architectural, structural and construction-process solutions in the production of housing components and in conducting construction and installation work. As for selection of a series of apartment buildings for which the fabrications will be produced at a given housing construction enterprise, the monograph proposes that one begin by evaluating the plant's capacity to manufacture the particular series, the level of labor intensiveness of manufacturing the fabrications of the different series, and the need for forms, equipment, and production and storage area. It is established in this connection that when standardization applies, altering the enterprise's capacity as a function of the series of houses being produced is the determining factor.

The monograph also sets forth the basic elements of procedures for determining the list of products of housing construction plants that corresponds to their technological conditions, demonstrates the possibilities of altering that list, and works out a system for distributing the output of products among the enterprise's production lines. A thorough examination is made of the principles of the organization of work of technological flows of the pattern-making shop of a housing construction plant, thereby affording it the possibility of making periodic changes in order to accomplish the output of a broad list of products. The management system recommended in this connection envisages operational intervention in production when there are departures from the planned course of the production process resulting from disruptions in deliveries of materials to the plant, in the operation of transport, in operations at construction sites, etc. Recommendations are also made on improving the system of material and technical supply, on comprehensive engineering preparation, and on fitting out projects under construction with manufacturing and processing equipment. In this connection it is very important to note that the principles and foundations the authors develop for the development and improvement of fully prefabricated housing construction also make it possible to solve more effectively many problems related to expansion of the network and improvement of the operation of rural housing and housing construction combines, which in the future are to become the basic organizational form of construction in rural areas.

The book is written in simple and comprehensible language, the results of analysis and scholarly treatments are clearly presented, and the experience of progressive collectives of housing construction combines is set forth. The study and solution of the problems posed are set in direct relation to the problems and tasks of developing capital construction as set forth by the 25th CPSU Congress and also subsequent decisions of the party and government, which enhances their practical significance and the role of the book as a whole. Moreover, most of the methods and principles the authors have developed have been used both in official instructions and procedures and also in the practical activity of existing combines.

Certain critical remarks can be made about the book's being oversaturated with various kinds of procedures though the advisability of their use is not always documented sufficiently. At the same time not enough attention is paid in the book to the economic aspects of the problem under consideration. The authors do not always give examples of practical use of the methods and standards they have developed. More straightforward definition should have been given for certain of the new concepts and terms introduced.

But the remarks we have made above do not diminish the value of the book being reviewed. The problems treated in it will unquestionably attract the attention of readers, above all those working in the field of fully prefabricated housing construction. The book is characterized by innovations in the statement and solution of most of the problems it examines and methods it develops and it is playing a constructive role in the development and improvement of large-panel housing construction in the country and in making it more efficient.

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CONSTRUCTION

UDC 658.527:728

TWO-YEAR FLOW-LINE CONSTRUCTION SCHEDULE

Moscow ZHILISHCHNOYE STROITEL'STVO in Russian No 2, 1981 p 8

[Article by L. S. Murlykov and V. P. Kaverin, engineers, Mosorgstroy, a trust of Glavmosstroy]

[Text] The 2-year flow-line construction schedule is the principal document in organizing and managing construction and has great importance to multiannual planning of construction and installation work.

Based on experience in applying 2-year planning in Orel, this method has also become widespread in Moscow.

At Glavmosstroy [Moscow Main Construction Administration] a 2-year flow-line construction schedule of residential and cultural- and consumer-service buildings is drafted annually; in it the first year being planned conforms entirely to the state plan and title list of Mosgorplan [Moscow City Planning Committee], while the second is the draft of the state plan. Aside from the trust Mosorgstroy, the participants in its drafting are the Administration for Preparation of Production, the Planning and Economic Statistics Administration, the Administration of ASUS [automated system for management of construction], production administrations and associations, general-contractor trusts and housing construction combines of Glavmosstroy and also GlavUKS [Main Administration for Capital Construction], Glavmosinzhstroy [Moscow Main Administration for Utility Construction], Glavmosmontazhspetsstroy [Moscow Main Administration for Installation and Specialized Construction], and Glavmospromstroymaterialy [Moscow Main Administration of the Building Materials Industry]. Mosgorplan provides the general coordination of the main administrations of Mosgorispolkom [Moscow City Executive Committee] in all aspects of compiling the schedule. The principal initial data for compiling the 2-year flow-line construction schedule are as follows:

i. construction time of standard housing and cultural- and consumer-service projects, which is worked out for Glavmosstroy;

ii. drafts of 2-year title lists for construction of apartment buildings from all sources of financing and the program of construction and installation work of Glavmosstroy;

iii. technical documentation on projects to be included in the 2-year schedule;

iv. limits for reinforced-concrete products for the series of buildings and the component production plan at housing construction combines;

v. the capacity of construction trusts;

vi. specialization of the trusts in various types of construction;

vii. drafts of title lists for construction of municipal installations, utilities and roads, etc.

The 2-year flow-line construction schedule consists of the following:

a. 2-year schedules of the production administrations and associations, including a breakdown by trusts and housing construction combines, construction administrations and installation administrations, in accordance with construction time for housing and cultural- and consumer-service projects;

b. summary tables of the commissioning of projects by production administrations, associations, trusts, housing construction combines and also house series;

c. summary tables of the commissioning of projects for Glavmosstroy as a whole (in square meters of total residential floor area);

d. calculated data on the necessary reinforced-concrete products to be made up for building series;

e. schedule with directive force of work Glavmosinzhstroy is to perform with respect to engineering preparation of the sites for large-scale housing construction;

f. schedule of sites to be made available for construction of apartment buildings and facilities for cultural and consumer services;

g. schedules of deliveries of the principal materials and products from enterprises of Glavmospromstroymaterialy and Glavmosmontazhspetsstroy (see the table).

						Space Being Built in and Added	Effective Area, m^2
Item No	Location of Project	Block	Building	Design Series	Client	Type of Foundation	Number of Apartments

Table (continued)

Quarter in Which Commissioning Is To Take Place	Deadlines for Client To Submit Technical Documentation	Trust Acting as General Contractor	Mixed Work Team	Work Done by Zlobin Method	Number of Tower Cranes	Progress of Construction as of 1 Jan	Year
Year	For Making Site Available						Quarter
							Month

The 2-year flow-line construction schedule reflects the entire program of Glavmosstroy's construction and installation work. It is the basis for compiling schedules of work on the infrastructure, local phase-by-phase schedules by types of construction (schools, children's preschool institutions, trade establishments, agriculture, etc.) and also weekly-daily schedules for integrated product delivery.

When the flow-line construction schedule was put into effect in Glavmosstroy, technological preparation of the construction process in building housing and cultural- and consumer-service buildings was also introduced. This technological preparation covers the process of planning capital construction and also links the plans of construction subdivisions and industrial enterprises manufacturing prefabricated components.

Thus the 2-year flow-line construction schedule is a tool of scientific management and the means of intensifying the construction process. Since it was introduced at Glavmosstroy a more uniform pace has been observed in the commissioning of projects for use, and utilization of labor reserves, tower cranes, machines and machinery has improved.

In Glavmosstroy the flow-line method has become one of the principal sources of raising production efficiency. Its use made it possible to reduce building construction time 12-15 percent, labor intensiveness 8-10 percent, and the cost of construction and installation work 4-5 percent.

The construction time of standard structures is based on progressive allowances that take into account accelerated flow-line and combined technology for erecting buildings, including performance of specialized operations both within the building and also the installation of utilities within blocks.

The 2-year flow-line construction schedule makes it possible to improve the internal consistency of the plans of all main construction administrations of the Mosgorispolkom, to link the operation of each flow in the process of installation (each work team) to the delivery of fabrications and products, and to achieve the uniform pace of commissioning of projects from month to month and quarter to quarter as assigned by the plan.

Drafting the 2-year schedule is a complicated and responsible task. For example, one of the 2-year flow-line schedules called for building and commissioning for service apartment buildings with a total floor space of 8.5 million square meters, 55 school buildings and vocational and technical schools, 70 buildings of children's institutions, 31 polyclinics, 34 hospitals, and 54 detached structures for trade and the food service industry. There were more than 3,000 projects in all.

The experience of construction organizations--associations, trusts and housing construction combines--in their operation in the 10th Five-Year Plan demonstrated the great organizational importance of the 2-year flow-line construction schedules. This makes it possible to manage the activity of a large number of construction associations, trusts, construction administrations, administrations for mechanization, makeup depots, transport organizations and enterprises of the building materials industry.

The production scheduling service of Glavmosstroy's ASUS monitors the adoption and fulfillment of the schedule; that component designates the divisions which are to monitor housing construction and work on the infrastructure and projects for cultural and consumer services, production, agriculture and other purposes. Deadlines are monitored for commencement and completion of work on the infrastructure, and day-to-day progress in terms of floors and sections is monitored in the direction of buildings. Information is constantly issued on the basis of this monitoring, and the causes of failure to meet deadlines are indicated. Speedy steps are thereby taken.

An analysis of fulfillment of the flow-line construction schedule for Glavmosstroy in recent years has shown that departures from the schedule do not amount to more than 8 percent with respect to the commissioning of apartment buildings for service.

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CONSTRUCTION

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MANAGEMENT OF CONSTRUCTION IN A LARGE REGION

Moscow ZHILISHCHNOYE STROITEL'STVO in Russian No 2, 1981 pp 10-11

[Article by L. P. Markizov and N. M. Bol'shakov, candidates of engineering sciences, Scientific Research Institute for Organization and Management of Construction of the Moscow Construction Engineering Institute imeni V. V. Kuybyshev, and A. N. Kochurin, engineer of the association Komityazhstroy]

[Text] Further combination of the regional and sectoral principles in managing construction is especially important in northern regions where the assimilation of capital investments is proceeding at faster rates than in other regions. Increasing the efficiency of capital investments must be based on further concentration of the construction effort and on more thorough specialization of construction by creating specialized regional construction and installation associations as components of the principal construction ministries operating as contractors in a given region.

Optimum combination of the regional and sectoral principles of management in the region has to be determined in solving the problems of further improvement of the management of construction in Komi ASSR. In order to present the problem more vividly, we will examine the ratio in the volume of construction between industrial and nonindustrial (proizvodstvennyy and neproizvodstvennyy) construction in Komi ASSR.

The share of nonindustrial construction has shown a steady tendency toward an increased volume of capital investments and construction and installation work. At the same time capital investments in nonindustrial construction are reaching about 20 percent of their total volume, and the share of construction and installation work in the volume of capital investments for the region averages 80-85 percent at nonindustrial projects.

Given the republic's industrial development, the volume of capital investments in the nonindustrial sphere will increase. At the same time in nonindustrial construction in Komi ASSR there has not been the necessary linkage in a number of cases to the rates of construction of industrial enterprises and complexes. There have been examples when production capacities of mines, factories and plants, and enterprises in the petroleum and gas industries being put into operation did not have a sufficient amount of housing, not to mention a complete social infrastructure. This has been adversely affecting the supply of manpower to the enterprises and has brought about high turnover of personnel. At a number of enterprises construction workers have been compelled to turn over to the operators their own teams of skilled workers, who had been furnished housing.

Summarization of the experience of nonindustrial construction in the region makes it possible to draw the following conclusions:

i. there has not been the necessary coordination in the activity of participants in construction--the project planner, the client and the contractor;

ii. standard amounts of partial construction and construction time have not been adhered to because of incomplete allocation of capital investments;

iii. the clients for nonindustrial construction are 118 organizations and enterprises of different ministries and departments, some of which do not have the necessary amounts of capital investments;

iv. contract work has been done by about 150 production units (construction administrations, cost-accounting sections, mobile mechanized construction crews, construction and installation work trains, etc.) of different ministries and departments;

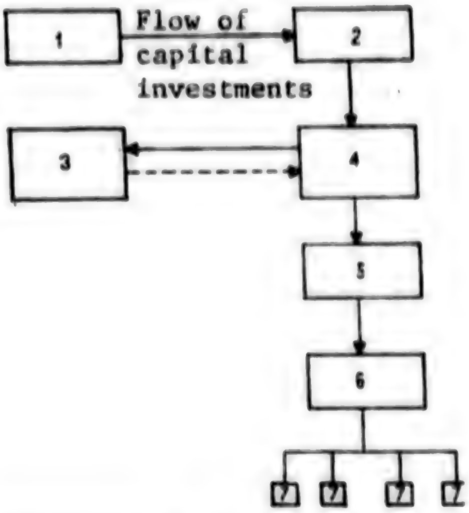
v. more than 10 project planning organizations subordinate to various ministries and departments have been doing the project planning (and linkage) of diverse projects belonging to the social infrastructure.

Thus in the present state of affairs there has not been opportunity enough for comprehensive resolution of the problems of developing the social infrastructure of cities and settlements, of pooling funds and of guaranteeing commissioning of the projects for service on time. It is therefore necessary to solve the problem of managing nonindustrial construction under the conditions of the Komi region as a whole.

Creation of capital construction administrations, under the Ukhta Gorispolkom in 1975 and that of Syktyvkar in 1978, made it possible to undertake concentration of capital investments on nonindustrial construction in those cities, though the principal problem (comprehensive and integrated development of the cities) has not yet been solved.

In order to bring the pattern of management of nonindustrial construction into conformity with the principles of the USSR Constitution (Article 146), which states that local soviets of people's deputies are to supervise state, economic and social welfare and cultural construction within their jurisdiction, it seemed advisable to adopt the regional principle of management and to promote further development of a system of concentrating the functions of clients in gorispolkoms (see the figure).

Creation of the construction and installation association for nonindustrial construction in Komi ASSR consisting, for example, of the association Komityazhstroy of the USSR Ministry of Construction of Heavy Industry Enterprises (in 1967 that ministry was designated as the principal construction contractor for Komi ASSR) will make it possible to administer housing and other types of nonindustrial construction on the basis of a purposive and unified system. This kind of structure will be especially effective if the chief of that organization is granted the powers of the first deputy chief of the association Komityazhstroy, which would enhance his rights and responsibilities. When nonindustrial construction is concentrated in one organization, there will be improvement in the quality, the degree of industrialization, and also the smooth flow and uniform pace of project completion. Endowed with new and broader rights, the capital construction administration of the Council of Ministers of Komi ASSR and the capital construction administrations of gorispolkom will carry out the comprehensive and integrated development of cities and large settlements, guided by the "Regulation on Mutual Relations Between the Single Client for Housing, Cultural- and Consumer-Service and Municipal Construction in Cities With Enterprises (Organizations) of USSR Ministries and Departments Transferring Capital Investments to It on the Basis of Shared Participation," which has been approved by USSR Gosstroy.



Basic proposed scheme for management of construction of nonindustrial projects in the region of Komi ASSR: 1--sectoral all-union and union-republic ministries figuring as clients for nonindustrial construction; 2--administration for capital construction of Komi ASSR--the single general client in the region for nonindustrial construction; 3--the institute Grazhdanproyekt (in Syktyvkar) with branches in the cities; 4--capital construction administrations of city (rayon) ispolkoms of soviets of people's deputies--the single clients in cities; 5--unified general construction organization; 6--republic construction and installation association for nonindustrial construction--the single contractor; 7--housing construction combines, trusts and construction administrations in the cities.

The regional principle in management of nonindustrial construction, in our opinion, should not extend to rural and forest localities, where this construction is mainly decentralized and has specific features of its own; the sectoral principle for management of this type of construction, which is done by the trusts of Komisel'stroy, Komilesstroy and Pechorlesstroy, would be left in place.

The regional principle of administration of nonindustrial construction in Komi ASSR will make it possible to bring decisionmaking concerning the construction process closer to those elements which have the most information and the necessary competence in administration of construction subdivisions, which makes management more concrete, effective and responsive.

Administration of nonindustrial construction should be organized according to the following scheme: the single contractor (republic association within Komi ASSR for nonindustrial construction and its subordinate subdivisions in cities), the single client (capital construction administration of the Council of Ministers of Komi ASSR and the capital construction administrations of gorispolkoms) and the single project planner (the institute Grazhdanproyekt in Syktyvkar with branches in those cities where there are single clients).

According to the preliminary conceptions which have been worked out, improvement of the management of housing and public works construction in Komi ASSR would be done in two stages. In the first stage regional (at the four points where construction is concentrated) specialized construction and installation associations, which are subordinate to the principal ministries figuring as construction contractors: in Syktyvkar, Ukhta, Pechora (Usinsk) and Vorkut. In the second stage, in order to ensure unified and scientifically sound planning of housing and public works construction in the region as a whole, a republic association is set up for nonindustrial construction and would be subordinate to the single general construction organization for Komi ASSR.

At the time of the conversion which is to be made to the regional principle of management of nonindustrial construction, there will also be a need for reorganizing management of the enterprises of the construction industry. When the construction and installation association is organized, provision will have to be made within it for enterprises to manufacture dobornyye and individual reinforced-concrete fabrications and components. These enterprises should be subordinate to the administration for production technology acquisitions. Deliveries of large fabrications and components should be made in cooperation with enterprises of the construction fabrications industry of regional interdepartmental associations. Production capabilities for large-panel housing construction should be left on the unified construction balance of the housing construction combine.

In order to eliminate interdepartmental divergence of interests in the production of construction fabrications and components, interdepartmental associations must be created for areas of concentrated construction on the basis of shared participation of all construction organizations in that area. This form for managing enterprises of the construction fabrications industry will make it possible to optimally combine the interests of individual departments with requirements for development of the industrial capability of contracting organizations serving the region according to a single plan.

The management scheme we are recommending affords the possibility of creating in the future a single centralized body for direction of the construction fabrications and components industry--the republic association Komistroyindustriya.

In our opinion an analogous principle of step-by-step concentration and specialization of construction and concentration of the principal amounts of work to build nonindustrial projects in regional associations which have a single client and a single project planner could also be used in other large regions if their peculiar features are taken into account.

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POTENTIAL FOR CAST-IN-PLACE CONCRETE HOUSING CONSTRUCTION IN RURAL AREAS

Moscow ZHILISHCHNOYE STROITEL'STVO in Russian No 2, 1981 pp 19-20

[Article by A. M. Lysova, engineer, Central Scientific Research Institute for Experimental Planning of Rural Public Works Construction]

[Text] Use of the industrialized method of housing construction with cast-in-place concrete has altogether real possibilities in rural areas. Calculations demonstrate that this method requires smaller capital investments for the material and technical base of constructionand a shorter preparatory period for construction. In the absence of good roads that make it possible to transport prefabricated components to construction sites without damaging their quality, cast-in-place concrete housing construction turns out to be preferable. It is then possible to transport commercial concrete from plants and to use mobile concrete plants and concrete mixers at the construction site. The set of forms makes it possible to erect apartment houses and public buildings. This method is rather versatile and makes it possible to combine cast-in-place concrete construction with the use of plant-manufactured wood products for industrialized construction.

The Central Scientific Research Institute for Experimental Planning of Rural Public Works Construction has developed and Rosorgtekhsel'stroy has manufactured universal metal forms* for erecting cast-in-place concrete structures of residential and public buildings, which makes it possible to pour concrete in a single construction area whose size is 4.8 x 3.6 meters. The lengthwise spacing interval is changed by moving the forms in a horizontal direction; a transverse change in spacing is made by turning the form 90° in the horizontal plane. The weight of the forms is 3.9 tons, and the approximate cost 3,200 rubles (converted to 100 meters of the axial line of the forms, this corresponds to the present price level). Design proposals have been worked out for the principal types of dwellings and the most common types of public buildings to be erected with the mobile forms. Thanks to the search for optimum form size that made it possible to obtain rooms in apartments of a size that takes into account present and future allowances in designing dwellings in rural localities, the dimensions 3.6 x 4.8, which corresponds to the uniform module system, were arrived at.

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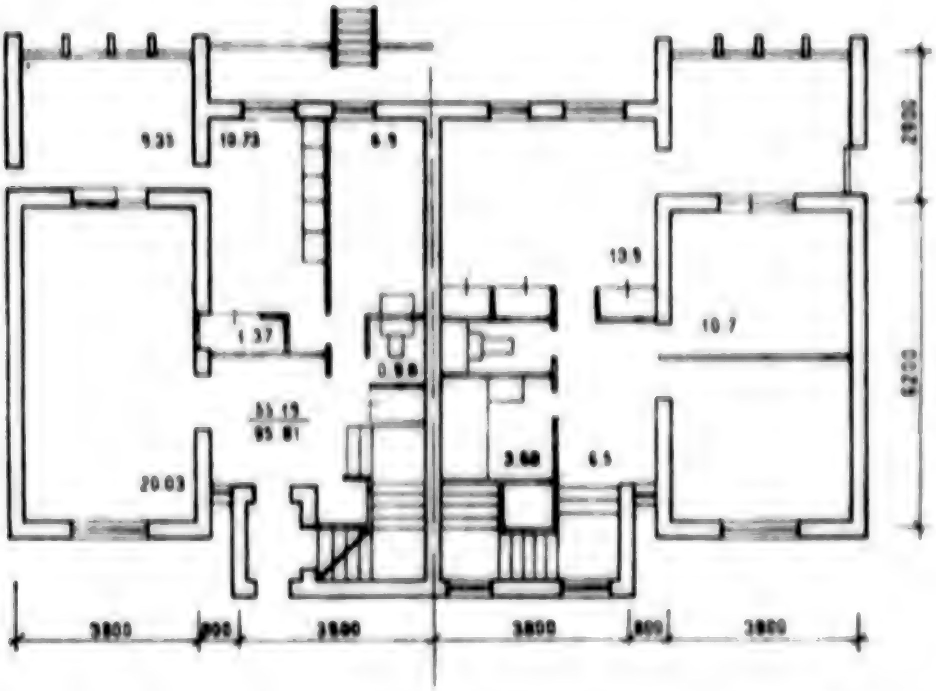
* Author's certificate No 709786, OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI, No 2, 1980.

In order to discover the effectiveness of cast-in-place concrete housing construction in rural localities, a technical-and-economic evaluation was made of the technical solution by a method of the Central Scientific Research Institute for Experimental Design of Housing,* which takes into account the present level of prices of materials, fabrications and equipment, and wages.



Two-unit apartment house with apartments on two levels. Plan of the first story.

Indicators	Structural Type of House Cast-in-Place Concrete	 Panel
Cost of erecting the principal load-bearing and dividing structures, rubles	48.3	59.8
Cost of erecting buildings, rubles	124.7	136.2
%	91.5	100.0
Specific capital investments, rubles per year	47.5	99.0
%	48.0	100.0
Imputed costs for the principal fabrications (at K_n = 0.12), rubles	56.6	76.3
%	74.2	100.0
Same as above, per house, %	84.3	100.0
Labor intensiveness of erecting the principal load-bearing and dividing constructions, total man-hours	10.9	13.5

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* "Rekomendatsii po sravnitel'noy tekhniko-ekonomicheskoy otsenke konstruktsiy monolitnykh, polnosbornykh i kirpichnykh zdaniy razlichnoy etazhnosti" [Recommendations on Comparative Technical-and-Economic Evaluation of Structures of Cast-in-Place, Fully Prefabricated and Brick Buildings of Various Heights], Moscow, Central Scientific Research Institute for Experimental Housing Design, 1979.

Table (continued)

Indicators	Structural Type of House Cast-in-Place Concrete	 Panel
Breakdown:		
At the plant	3.4	8.8
Transport	2.4	2.7
At the construction site	5.1	2.0
Consumption of the principal building materials for load-bearing and dividing structures of the portion of the building above the surface:		
Concrete, m^3	1.1	1.1
Steel, kg	13.6	15.8
Wages, rubles	6.6	11.5

An experimental design of an interlocked two-unit apartment house with apartments on two levels (Pokrov, Vladimirskaya Oblast) was taken as the representative project for the evaluation. The fabrication of a panel house was taken as the analog for comparison.

The comparability of the cost of the projects being compared was ensured.

The calculated figures on construction and installation work take into account the entire set of costs incurred in manufacturing fabrications and intermediate products and their transportation to the construction site, and the assembly (erection) of the fabrications. The comparative technical-and-economic indicators (per square meter of total floor space) of the structural method of building the two-story two-unit interlocked house under the conditions of Vladimirskaya Oblast are given in the table.

The cost of construction and installation work for the two versions takes into account the entire set of costs incurred in manufacturing the fabrications and intermediate products, transporting them to the construction site, and the assembly of fabrications (erection of structures).

Capital investments in the material and technical base of construction are equal to the total capital investments for in-plant production of fabrications (intermediate products), their transport to the construction site, fixed productive capital of construction organizations employed in erecting (assembling) the structures of the apartment buildings; and the working capital of construction organizations.

The indicator of imputed costs was taken as the principal indicator for comparing the efficiency of the different building methods.

Taking into account the real potential for further improvement of the structures of cast-in-place concrete buildings thanks to reduced labor intensiveness and materials intensiveness, the use of cast-in-place concrete is more efficient.

Thus cast-in-place concrete housing construction ensures flexibility and diversity of solutions as to architecture, layout and structure, and it affords the possibility of optimum combination of cast-in-place concrete structures and reinforced-concrete fabrications. In addition, by comparison with fully prefabricated and piece-by-piece construction, cast-in-place concrete housing construction makes it possible to reduce the original capital investments in the construction capability, to speed up the return of capital spent on forms and materials-handling machinery, which can be used at all projects; there is also on reduction of outlays to remunerate manpower because preparation of construction takes a negligible period of time.

As the calculations show, the largest share of labor expenditures is for forming, and therefore when this method is introduced it is possible to economize on resources and reduce labor input by improving the structural characteristics of the forms and also by applying other improved types of forms.

Optimum methods of making and delivering the concrete mix should be developed with respect to the specific construction conditions, the size and capabilities of the construction organization and the scale of construction.

A shortcoming of this method is the seasonal nature of the work. The higher cost in the wintertime, the need to cure the concrete for longer time to gain strength, may nullify all the economic advantages. Taking this into account, the method of cast-in-place concrete construction should be used in warm climates or in the summer months.

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CONSTRUCTION MACHINERY

ARMENIAN BUILDERS NOT MAKING OPTIMUM USE OF CONSTRUCTION MACHINERY

Yerevan PROMYSHLENNOST' ARMENII in Russian No 10, Oct 80 pp 53-54

[Article by engineers N. A. Akopyan and V. G. Klekchyan: "Raise the Level of Mechanization of Construction and Installing Operations"]

[Text] Despite definite successes achieved by Kirstroy [Kirovakan Construction Trust] in meeting capital construction plans, the mechanization of construction and installing work still is not at the proper level here, productivity of the existing fleet of machinery and mechanisms is low, and plastering, concreting and loading and unloading operations are being performed manually.

Last year the trust operated only 111 out of 124 construction machines of various types. Analysis has indicated that idle machinery time, which was 20-25 percent of total worktime, rose mainly because of the lack of work fronts, electricity, motor-vehicle transport and so on. The workloads on construction machinery were: 93.6 percent for tower cranes, 94.8 percent for excavators, 97 percent for bulldozers and 90.4 percent for crawler cranes.

Kirstroy's ineffective use of construction machinery is explained by the fact that substantial technological and organizational interruptions are allowed. The productivity of some machines is very low, and an accurate accounting of the work done by each of them is lacking.

Moreover, as inquiry has shown, the trust's construction machinery fleet has not been outfitted adequately with small-capacity machines for performing subsidiary operations and small amounts of scattered work. This circumstance frequently forces the use of high-capacity machines, which leads to ineffective utilization of them. Because of a lack of appropriate machines, earthmoving work in small amounts (cleaning the slopes of foundation pits and trenches, compacting earth, and so on) still has not been mechanized to the necessary extent.

Matters are going especially poorly with the mechanization of plastering. In the past 2 years 471,000 rubles' worth of plastering and 724,740 rubles' worth of painting (671,600 and 868,000 m^2, respectively) were done manually within the Kirstroy system; only the whitewashing of walls, ceilings and the surfaces of reinforced-concrete structures was done by the semimechanized method.

Research results have shown that the trust can cut the labor intensiveness of decorating operations by two-thirds and the time required in half with the rational organization of work and the application of existing machines and mechanisms. The experience of domestic and foreign construction indicates that in the modern era the degree of mechanization of decorating work can be brought up to 30-40 percent, since there are appropriate machines and mechanisms for this purpose.

In the last 2 years of the 10th Five-Year Plan Kirstroy did 41,000 m^3 of concreting work manually with a labor intensiveness of 10,750 man-shifts. Only the preparation of concrete, which is being performed in a centralized procedure at a concrete and mortar complex,has been almost completely mechanized. The concrete basically is transported in dump trucks. This causes disintegration of it and loss of quality.

Things are going still worse with the trust's loading and unloading operations: the loading and unloading of building materials, except for prefabricated structure, is basically being done manually, or, in the best case, by the semimechanized method.

One of the decisive factors in raising the level of effectiveness in the mechanization of construction and installing work is the use of small-scale mechanization and power tools. Correct organization of inventiveness and rationalization play a major role in their production and introduction. However, Kirstroy has not recorded one invention in the past 2 years, and of 87 adopted rationalizer's suggestions, 71 were introduced in all.

In order to raise the level of mechanization of construction, correct organization of the technological servicing and repair of construction machinery, the optimal use of which depends upon its constant running order and efficiency and upon the level of its technical servicing and repair, is of great importance. The readiness of machines for operation is described by the technical readiness coefficient, which is fairly low for some of the trust's machines.

The level of mechanization of construction and installing operations is a function of the following indicators: the utilization factor of the construction machinery fleet with respect to time; the utilization factor for vehicles with respect to time; the utilization factor for machinery with respect to productivity; and the shiftwork factor for the machines. In Kirstroy these are equal, respectively, to 0.59, 0.93, 0.94 and 1.3, which are much lower than in the country's advanced fleets.

In order to raise the level of mechanization of construction and installing work it is necessary: to achieve optimal composition and structure of the construction machinery fleet; to improve reporting of machinery operation by the use of an automatic reporting method; to improve methods for servicing and repairing construction machinery, mechanisms and equipment; to strictly observe the planned preventive maintenance system; to introduce the component-and-assembly method of repair; to mechanize repair work; to organize special brigades for the servicing and repair of construction machinery; and to improve the training and retraining of repair workers and equipment operators.

11409
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ARMENIA'S MACHINERY MANUFACTURING CONTINUES TO GROW RAPIDLY

Yerevan PROMYSHLENNOST' ARMENII in Russian No 11, Nov 80 pp 86-88

[Article by A. S. Alpetyan, deputy chief of the Machinebuilding Section of Armenian SSR Gosplan: "Armenia's Machinebuilding"]

> [Text] "The union of science with production and the effect of progressive ideas on it occur in practice through machines and technology. Hence, nothing has a role comparable with machinebuilding in developing the national economy and in raising labor productivity."--L. I. Brezhnev.

Prior to the establishment of Soviet power, machinebuilding was practically almost nonexistent in Armenia's economic system.

Machinebuilding began to be formed as a branch of industry after 1945. During the Great Patriotic War a number of plants were organized: Armelektrozavod, plants for electric motors, compressors, pumps and automotive spare parts, and, during the first postwar plan (1946-1950)--plants for cable, timepieces and electrical measuring instruments, the Avtogenmash plant and other plants.

For the first time the production of metal-cutting tools, air compressors, pumps, generators, power transformers, cable products, instruments, timepieces and so on was mastered.

Output of the machinebuilding branch's production rose 4.23-fold while the republic's industry as a whole grew 2.68-fold.

In the next five-year plan (1951-1955), machinebuilding output rose 2.61-fold, while all industry grew 1.9-fold. About 30 new plants were created. On that basis, in 1956-1958 machinebuilding enterprises were organized: in Yerevan--electrical apparatus, instrumentmaking and milling machine tool enterprises and Stankonormal'; in Leninakan--electrical-equipment, grinder and analytical-instrument enterprises; and in Charentsavan--a machinebuilding plant and other plants. New productive capacity was also created.

During 1956-1960 machinebuilding production grew at a 2.66-fold rate (when growth of industry was 1.66-fold) and its share in industrial output rose to 14.4 percent.

During 1959-1965, 37 new enterprises of various branches of machinebuilding were created, including 6 in the electrical-equipment industry, 5 in instrumentmaking, 11 in the machine-toolmaking industry, and 10 in the radio and electronics industry, laying the foundation for new, progressive branches of machinebuilding. Such a pace of development is explained also by the fact that machinebuilding is providing needed employment for the population, including youths with technical education.

With the establishment of new production facilities, serious attention was devoted to improving production organization and to specialization as a more economically desirable type of production.

The industry has developed all the main types of specialized production facilities:

--for end-product specialization, in the output of machines, machine tools, instruments, electrical equipment and so on;

--for parts specialization, in the output of parts and components for machinery and equipment; and

--for technological specialization, in the production of castings, forgings, articles made of plastics, and so on.

The specialization of enterprises has helped machinebuilding to grow into mass production and large-series production, with the appropriate machinery and technology.

During the 1960-1965 period the output of machinebuilding products rose 2.2-fold, and machinebuilding's share in the republic's total industrial production volume reached 21 percent.

The products mix of items produced has been expanded, and these are now technically complicated articles--electrical machinery, transformers, low-voltage apparatus, illumination-engineering products, metal-cutting machine tools, monitoring instruments and automation, computer and other equipment.

During this period the electrical-equipment industry, instrumentmaking and the machine-tool and toolmaking industries were the most developed branches, their share in 1965 being more than 80 percent of all the machinebuilding output, the key electrical-equipment industry's share comprising about 57 percent.

Machinebuilding development in 1966-1970 was marked by the new terms for economic reform for planning and managing industry. Machinebuilding enterprises transferred to subordination to the branch machinebuilding ministries.

Work was started at enterprises to expand, rebuild and reequip.

The organization of production was improved, and the technical level of output was raised. The foundation was laid for organizing production associations, which helped to further develop specialization and make better use of production reserves. The Armelektrosvet production association that was created specialized in the output of luminaires and illumination-engineering equipment; and the Armelektrodvigatel' production association specialized in asynchronous electrical motors of less than 100-kw power and of small power.

Production volume increased 2.05-fold in machinebuilding during 1966-1970.

The republic's machinebuilding products have been given recognition at international trade fairs and expositions and at the VDNKh SSSR [Exposition of Achievements of the National Economy of the USSR], and they have repeatedly been awarded medals and certificates.

An appreciable contribution to machinebuilding development has been made by the industry's scientific-research institutes and design-development and technological organizations, whose number reached 20 in 1970, including 9 institutes and branches of Union institutes, 6 divisions of institutes, 5 special design-development and technological bureaus--2 of the institutes and the 6 divisions having been organized during 1966-1970.

During the next five-year plan, the Ninth (1971-1975), machinebuilding continued its development at an outstripping pace. Work was done to expand, rebuild and technically reequip enterprises and to raise the technical level and quality of the products produced. Production control was improved. Eight new associations and 13 plants were created.

A consolidation of enterprises has enabled rational use of production reserves. The share of the 11 production associations in 1975 was 50 percent of the production volume of the gross machinebuilding product.

Seventeen branches were organized in small towns and rayons of the republic, which will enable the task of specialized employment of the population in provincial areas to be solved successfully and will promote the industrial and cultural development of these regions. Output produced during the Ninth Five-Year Plan rose 1.8-fold, with an average annual growth rate of 12 percent, versus 7.8 percent for the republic's industry as a whole. A large additional number of ablebodied members of the population were brought into this production work.

At the July 1975 CPSU Central Committee Plenum of the Communist Party of Armenia, the first secretary of the republic's Communist Party Central Committee, Comrade K. S. Demirchyan, noted in his report that development of the republic's industry should be accomplished on the basis of radical improvement of its structure, through the speeded-up development of branches of machinebuilding and other branches of industry that are not materials intensive but have high sophistication and a high level of production. This development will enable the solution of a socioeconomic task that is important to the republic--to provide employment in social production to the able-bodied populace.

The development of machinebuilding during the 10th Five-Year Plan was completely subordinated to the solution of this task. The paramount tasks of the 10th Five-Year Plan were the acceleration of scientific and technical progress and a rise in the level and quality of output.

In accordance with the CPSU Central Committee and USSR Council of Ministers decree, enterprises are being expanded, rebuilt and reequipped with machinery.

Since the start of the 10th Five-Year Plan, 12 new enterprises and 18 branches have been created and 13 associations have been organized. Machinebuilding of Union subordination is now represented by 165 production facilities, which structurally represent 24 production and science-and-production associations and 42 enterprises with 14 branches.

The production facilities developed in the republic are, relatively speaking, not intensive in the use of materials, energy or water.

The industry's enterprises are now producing 20 percent of the generators produced in the Union, 11 percent of the illumination-engineering equipment, 33 percent of the instruments and automation equipment, 9.6 percent of the electric motors of less than 100-kw power and 4.4 percent of those of more than 100 kw, 7.6 percent of the metal-cutting machine tools, and so on.

Among the broad products mix produced by machinebuilding enterprises, the substantial production volume of commodities for cultural, personal-amenity and household purposes, which, on the whole, make up about 11 percent of the industry's total production, should be noted.

The enterprises are paying earnest attention to raising output quality. The production of articles of the highest quality category is rising systematically, and during the year it will reach 25 percent of all commodity output, including 44 percent in the electrical-equipment industry, 40 percent in chemical machinebuilding, and 30 percent in the machine-tool and toolmaking industry, while for individual enterprises the output thereof is: 59 percent at the Armelektrosvet production association, 71 percent at the Armelektroapparat production association, 31 percent at the Zakavkazkabel' production association, 75 percent at Kirovakan's Avtogenmash plant, 65 percent at the Kirovakan Precision Machine-Tool Plant, 60 percent at the Charentsavan Machine-Tool Plant, 76 percent at the Leninakan KPO [Forging and Pressworking Equipment] Plant, and so on.

The industry's products are being exported to socialist and capitalist countries.

Machinebuilding development has promoted the creation of industrial clusters of a definite production profile.

The production, scientific and technical bases for machinebuilding that have been established in the republic and the presence of higher and secondary technical institutions, which provide enterprises with engineers and technicians, also enable further development of the republic's machinebuilding at a rapid pace. In the near future machinebuilding should be developed in the area of updating production facilities to produce articles at a high technical level and of raising production sophistication. The radio and electronics industry will be developed at an outstanding pace. Special attention will be paid to creating a highly developed machine-tool and toolmaking industry, based mainly upon new scientific and engineering solutions in the technology and organization of production.

The automotive industry will be specialized in the production of automotive loaders with capacities of 1 and 2 tons. The electrical equipment, instrumentmaking and other machinebuilding branches will be developed correspondingly.

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METALWORKING EQUIPMENT

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INTRODUCTION OF MEASURES FOR ENSURING PROPER USE OF MATERIALS

Moscow STANDARTY I KACHESTVO in Russian No 1, Jan 81 pp 19-21

[Article by M.A. Pryalin, Dnepropetrovsk State University: "Forecasting a Change in the Value of the Principal Indicators of the Technological Qualities of Machines in Connection With the Introduction of Measures for Achieving the Proper Use of Materials"]

[Text] The technological qualities of machines predetermine to a considerable degree the technical-economic indicators for production and the volumes of national economic resources required for their manufacture. Thus the coordination of technological matters, from the standpoint of systematic analysis, with the overall complex of tasks associated with improving production, is of substantial importance.

During various stages in the creation of machines, the developer does not have at his disposal an adequate volume of information for carrying out his computations using the traditional methods and thus a requirement appears for developing special evaluative methods.

In conformity with GOST [State Standard] 18831-73 and GOST 14.202-73, labor intensiveness and the technological production costs for machines are used as the principal indicators for the technological qualities of structures. In the process of optimizing the variants for the constructive and technological solutions and improving the technological qualities of structures, a requirement develops for forecasting the effect of measures aimed at achieving the proper use of materials based upon the principal indicators for technological qualities, since a reduction in the norm for material expenditures does not always bring about a reduction in labor intensiveness or in the production costs for the manufacture of goods, owing to the additional expenses involved in carrying out the measures for raising the coefficient of use of the material $K_{ИМ}$. The additional expenses may be caused by the introduction of a more improved technological process for the shaping of parts, by an increase in the quality requirements for the products being produced and by a difference in the physical-chemical properties of the replacement materials and so forth. In connection with the dual effect of measures aimed at raising the $K_{ИМ}$ for labor intensiveness and production costs for the manufacture of machines, a task arises in connection with the optimization of this indicator. The urgency attached to solving this task derives from the need for ensuring the proper use of those resources required for the creation of a definite type of machine. The criteria for optimizing the Y_h values for $K_{ИМ}$, in general form, can be represented by a function which appears as the algebraic sum,

$$Y_h = \Delta Y_h + Y_d. \qquad (1)$$

where ΔY_h -- is a change in the value for the principal indicators for technological qualities, in view of the realization of measures aimed at raising $K_{ИМ}$;

Y_d -- an additional increase in the indicators for technological qualities, caused by the introduction of certain measures aimed at increasing the norm for material expenditures (for example, more improved technological processes).

Understandably, a minimal value for the criterion (1) will correspond to a more acceptable value for $K_{ИМ}$. The optimization of $K_{ИМ}$ must be carried out during the early stages in the structural preparation of production, at which time opportunities will still exist for selecting constructive-technological solutions from among a number of possible alternatives. During this period, the computational methods are distinguished by an approximate nature, since the work is carried out under severe limitations in the nomenclature for the available initial data. The cited coefficient $\bar{K}_{ИМ}$ is used as the object of optimization and it is found in the following equation with the generally accepted coefficient $K_{ИМ}$:

$$\bar{K}_{им} = a_k K_{им}. \qquad (2)$$

where a_k -- is the statistical coefficient which takes into account the expenditure of net weight for technological tests ($a_k \geqslant 1$).

Experience reveals that the mentioned coefficient changes within negligible limits for similar type structures, but it can differ substantially depending upon the type of machine.

The raised requirements for reliability and quality of execution bring about an increase in the volume of technological testing. In such instances, additional parts intended to be used for technological testing are manufactured for each serially produced machine. The additional volumes of machine components are taken into account when computing the norm for material expenditures. Thus when $a_k > 1$, an evaluation of the degree of proper expenditure of materials in accordance with the coefficient $K_{ИМ}$, which does not take into account in the net weight structure the material expenditures for the manufacture of parts and units for the carrying out of technological tests, leads to a correlation of the incomparable values for the net weight of parts used in the manufacture of machines and of the norm for material expenditures, taking into account the additional expenditures for the technological tests. It is obvious that in this instance it will be necessary to use the coefficient $\bar{K}_{ИМ}$ (the indicator $K_{ИМ}$ is a frequent occurrence of $\bar{K}_{ИМ}$). The coefficient $K_{ИМ}$ can be used when $a_k \approx 1$, that is, for machines the production of which is not characterized by a large volume of technological tests. Subsequently, we will use the indicator $\bar{K}_{ИМ}$ for evaluating the degree of proper material expenditures.

The additional expenditures associated with the introduction of measures for raising $K_{ИМ}$ can be determined using the direct method. Whereas the value Y_k is determined from the standpoint of the technological production cost, the expenses constituting Y_d are taken not in their full volume but rather they appear as the total of the items of calculated expenditures included in the technological production cost. When determining the criterion for labor intensiveness, there is no longer a need for additional work associated with eliminating certain items of calculated expenditures, since all of the component parts of the function (1) are examined in comparable values.

In order to determine the composite formula (1) ΔY_k, the method of approximate evaluation is recommended; it is suitable for carrying out computations during the early stages of design preparation for production. When evaluating Y_k for labor intensiveness, ΔY_k will appear as a change in this parameter, caused by a difference in the volumes of materials processed owing to a different norm for their expenditures. If the evaluation is carried out according to the parameter "technological production cost," then it will be necessary additionally to take into account the deviations in the extent of expenditures for materials, associated with a change in the norm for their expenditures. A change in the norm for material expenditures is taken into account by the indicator γ, which can be determined using the formula:

$$\gamma = \frac{\Delta H}{H_1}, \tag{3}$$

where ΔH -- is the change in the norm for material expenditures, when measures are introduced for improving the technological qualities of the structures;

H_1 -- is the initial norm for the expenditure of materials.

The deviations in the extent of material expenses ΔC_M, associated with a change in the norm for their expenditure, are evaluated according to the formula:

$$\Delta C_{\text{м}} = \gamma C_{\text{м}}, \tag{4}$$

where C_M -- represents the expenses for materials.

The change in labor intensiveness ΔT, caused by a deviation in the norm for material expenditures, is determined in like manner.

$$\Delta T = \gamma T_1, \tag{5}$$

where T_1 -- is the initial labor intensiveness for subsequent processing of the parts.

Where there is only a limited amount of information available, use can be made of the statistical coefficient β, determined for each type of machine using the formula:

$$B = \frac{T_1}{M}, \tag{6}$$

where M -- is the net weight of the machine.

Taking into account (6), formula (5) appears as

$$\Delta T = \gamma \beta M. \tag{7}$$

Thus the function (7) makes it possible, without carrying out a large number of computations, to evaluate the change in labor intensiveness for the manufacture of the machines, when there are deviations in the norm for material expenditures compared to the initial value. The appropriate changes in labor intensiveness for deviations in the amount of wages for production workers $\Delta \text{З}_{n}$ are

$$\Delta \text{З}_{\text{п}} = a\Delta T \tag{8}$$

or

$$\Delta \text{З}_{\text{п}} = a\gamma\beta M. \tag{9}$$

where a -- is the statistical coefficient which establishes the ratio for the given type of machine, between the labor intensiveness under consideration and the wages of the production workers.

A change in the technological production cost ΔC_{T}, caused by the introduction of measures aimed at raising the technological qualities of structures, which brought about a deviation in the norm for material expenditures, can be determined using the formula:

$$\Delta C_{\text{т}} = k_1\Delta C_{\text{м}} + k_2\Delta \text{З}_{\text{п}}. \tag{10}$$

where k_1 and k_2 -- are the statistical coefficients which take into account the additional charges, in accordance with the expenses for materials and the basic wages.

The coefficient k_1 ($k_1 \geq 1$) describes the amount of additional payments for materials, associated with transport-procurement expenditures. The value for this coefficient is dependent upon the cooperation contacts existing between the enterprises, the distances between them and also upon the accepted types of transport shipments and the organization of operations. As a rule, the value for this coefficient is averaged out for an enterprise for all types of materials delivered. The coefficient k_2 ($k_2 > 1$) takes into account the total amount of all additional expenses, the determination of which is based upon the principal wages of the production workers.

In the case of approximate computations during the early stages of creating machines, an evaluation of the change in the technological production cost, when introducing the measures under consideration, can be simplified through the introduction of the statistical coefficient δ:

$$\delta = \frac{\Delta C_{\text{м}}}{\Delta C_{\text{т}}}. \tag{11}$$

Taking into account (11) and subsequent conversions, the function (10) appears as:

$$\Delta C_{\text{т}} = \frac{k_2\Delta \text{З}_{\text{п}}}{1 - k_1\delta}. \tag{12}$$

Experience reveals that the values for the statistical coefficients used change depending upon the constructive-technological and production characteristics of the machines created. Thus, in order to obtain quantitative evaluations at enterprises for each type of machine manufactured, it will be necessary to have an appropriate normative-statistical base and, in addition, data on the weight of the struture. The proposed method can be used for forecasting the feasibility of carrying out definite measures aimed at raising the K_{MM}, from the standpoint of their effect on the principal indicators for the technological qualities of the structures, and also for validating an order to the metallurgical industry for special procurements (for example, special shapes) for the specific production of a definite type of machine upon the condition of inequality $\Delta Y_n > Y_d$. This ensures that positive results will ensue from the introduction of measures aimed at lowering the norm for material expenditure.

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METALWORKING EQUIPMENT

INDUSTRIAL ROBOTS AT MINSK 'TERMOPLAST' PLANT

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 12, Dec 80 pp 38-39

[Article by V. Bibikov: "Manual Labor, A Hot Spot: Robot As Worker"]

> [Text] The CPSU Central Committee recently examined the question of "Steps to Increase the Production and Broad Application of Automated Manipulators in Branches of the National Economy in Light of the Instructions of the 25th CPSU Congress." The decree adopted noted that the party organizations of a number of oblasts, including Minskaya Oblast, have done a certain amount of work on creating and introducing industrial robots into production, permitting substantial improvement in labor productivity and the equipment use coefficient. One such enterprise is the Minsk "Termoplast" Plant. The first automated manipulators appeared here three years ago. This enterprise is now among the best in terms of the use of automated devices [robotization] in production.

The "Termoplast" plastics shop. You see almost no people. The basic technological operations are done here by mechanical doubles.

Here is a mechanical hand installed on a carriage, grasping a slab of raw material with two "fingers" made of thin steel springs, placing it in the die of a press mold. A punch is automatically dropped. While the substance is being polymerized, the arm is moved along a beam to a second press. Here, it takes the pressed-out parts and carries them to a broaching press. A light blow, and the processed pieces move down a chute into packages. In the meantime, the mechanical arm is repeating the cycle of operations described.

"Previously, all the operations we have observed here were done by hand," says I. Baklanova, an operator in the automated technological complex. "One's role now is to keep an eye on the devices. As a result, each worker services eight presses, rathat than the two previously. And the work has become quite a bit more interesting."

I. Baklanova points to the equipment control panel, where numerous lights are flickering on and off. Here, the robot is monitoring itself: in case of a malfunction, it sends audio and visual signals indicating where to look for the malfunction.

Complex installations which actually replace people are a logical extension of the policy of automating and mechanizing production, a policy followed for many years now by the plant leadership and its scientific-technical community. For example, numerous automatic and semi-automatic assembly devices are in use here. In 1975, it was decided to significantly reduce the number of servicing personnel in the plastics press sector. It did not seem possible to carry out that decision with the means available at that time. The experience of our own enterprises suggested that the way out was to introduce automatic technological [robot] complexes. Blueprints were acquired for an automatic manipulator for sheet stamping and a prototype was soon manufactured. At the same time, we were improving the press molds, equipping them with special catches and ejectors, and working out vibration-loading and control systems. Associates in the long-range planning design bureau labored over all this.

"The first prototype serviced a single press," deputy plant chief engineer Ivan Mechislavovich Pavlovich tells us. "While the parts were being polymerized, it stood idle for 40-50 seconds. Inefficient. We conceived an original rotating installation, which incidentally was recognized as an invention, and made the robot mobile. It could thus now service two presses. We currently operate 12 automatic manipulators, and eight more will be installed next year. We are already training operators and repairmen for this equipment. Robot equipment is constantly being improved: the electrical control circuits are being replaced by electronic ones which are considerably more reliable and pneumatic drive parameters are being optimized.

Robotization means not just the possibility of shifting difficult labor onto the shoulders of mechanisms, but also the possibility of significantly improving working conditions. Incidentally, "Termoplast" was awarded an AUCCTU diploma last year for successes achieved in this direction. The introduction of automatic manipulators was noted by a certificate of the presidium of the Belorussian republic board of the Scientific-Technical Society imeni S. I. Vavilov.

"We have in considerable measure already mastered robots," continued "Termoplast" chief engineer Arkadiy Andreyevich Pyzhov. "Ahead lies the creation of automated lines with built-in manipulators and the automation of such monotonous, low-productivity operations as loading press molds with fittings, for example. To this end, the long-range planning design bureau has been expanded and an electronics laboratory has been created.

Today, automatic manipulators are also being used successfully at the Gomel' Radio-Technological Instrumentation Plant, the Minsk Computer Equipment Production Association and a number of other enterprises. Many of them -- the MARS-2, designed to service technological equipment, the MAK-1 and MAK-3, designed for automated pressure-casting lines, the GNOM-2, designed to automate auxiliary operations in working plastics -- were developed in a Minsk design bureau. Its collective is currently engaged in creating means of comprehensively automating foundry and stamping production.

What will this complex feature? It turns out that an automatic manipulator cannot handle a machine tool one on one, if you can put it that way. It needs help from various loading devices, monitoring devices, and so on. All these mechanisms, "bound" in a single technological chain, is what we call the automatic technological [robot] complex.

"Take, for example, servicing the casting machine," explains design bureau department head Andrey Vasil'yevich Boyka. "In order to replace a person, we need installations which will ensure an optimum press mold temperature, a robot pourer, an apparatus to monitor the temperature of the metal being poured and a robot casting extractor. The complex cannot operate without devices to monitor press speed, pressure change in the press mold, press-mold occlusion stress and casting pressure density. In order to complete the technological cycle, we also require mechanisms which can deliver blanks to the quenching bath, feed seams to the press for removal, and finally, to send the pieces to the packing or a conveyor.

Such a complex is already being introduced at the Brest Electromechanical Plant. It will free four people for other work and enable us to save 30,000 rubles per year. The design bureau recently joined with the the Tiraspol' Foundry Machine-Building Plant in an effort to provide the plant with control systems and devices, while the enterprise will manufacture the mechanical portion of automatic technological [robot] complexes. This is the first step in extensively increasing the circulation of these developments. Multiple-operation cold-stamping automatic technological [robot] complexes created in the design bureau are being used at the Grodnenskiy Radio-Tape Recorder Plant and the Vitebsk Television Plant.

The robot is playing an increasingly appreciable role in production. It a little while, it will replace people at all hazardous, fatiguing and nonproductive jobs.

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